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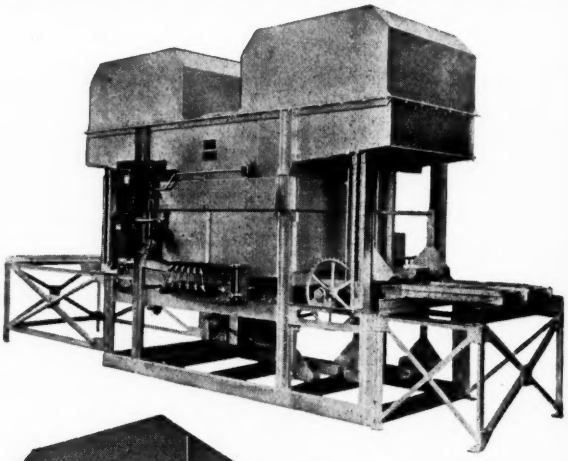

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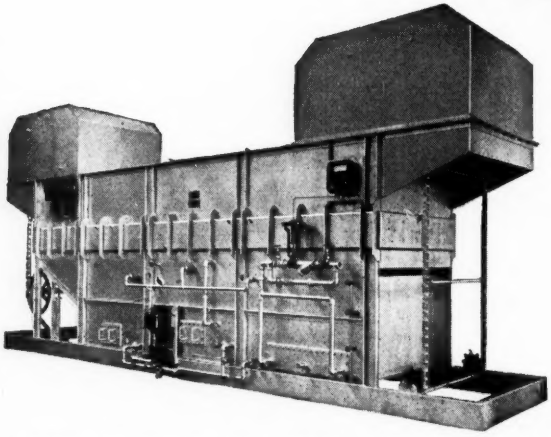

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CINCINNATI, OHIO VOL. 1, No. 7

APRIL, 1937

Tanks for the Plating Room

In this article the author describes tanks for alkaline cleaning and rinsing, acid pickling and dipping, and plating solutions.

By NATHANIEL HALL, CH.E.

THE subject of equipment and containers for the various solutions used in modern plating rooms includes probably more materials of construction than can be found in any other industry. Because the labor cost is the most expensive item in the finishing of metals, because the plating room itself is the bottle-neck in many plants, and, because duplicate equipment to take care of emergencies is rarely installed, it is essential that the proper materials be used for the elimination of contamination and corrosion, either of which may result in the premature loss of the solution.

Although in general, these solutions may be divided into three classes: acid, neutral, and alkaline, yet every chemist and engineer is aware of the fact that usually additional factors are found which do not permit the use of any one type of material for all solutions, that is, in any one class. Among these factors may be mentioned the oxidizing character of the solution, solubility of any reaction products, temperature, chemical displacement of the metal from the solution and the degree of acidity or alkalinity of the electrolyte.

It is not possible in a paper of this nature to discuss fully all the considerations which are involved in the choice of a construction material so that we will concern ourselves mainly with common practice and modern trends with respect to the suitable materials for the several operations carried out in the plating room.

Alkaline Cleaning and Rinsing

Alkaline cleaning is done in steel tanks, with the solutions kept at or near the boiling point. These con-

Fig. 1—Illustration of a strip heating element bent into a circle.

tainers should be double welded steel tanks fitted with an angle reinforcement around the top. For tanks of from 100 to 300 gallons capacity 10 gauge stock is preferable and for larger sizes at least 3/16 inch plate should be used.

The solutions may be heated with electricity, steam or gas. Electricity

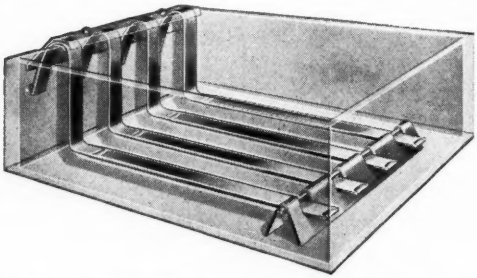

Fig. 2—Illustration showing electric immersion heater in position.

is more expensive than the other two for large tanks, except in certain places where power is cheap and fire hazards are great. Immersion heaters or strip heaters are employed, the latter being mounted on the outside of the tank and lagged, as shown in Figs. 1 and 2. The immersion heaters are much more expensive but have the advantages of greater efficiency and mobility. Where steam is not available, gas or oil burners are generally used. Heating may be effected by an open flame underneath the tank in which case the bottom of the tank is made of heavy steel plate. The drilled pipe burner, as shown in Fig. 3, is very popular in this type of installation. The open flame heating is inefficient and is rapidly being displaced by immersion gas or oil heating. In these units, one of which is shown in Fig. 4, the fuel is burned in a coiled 3 or 4 inch flue pipe, generally of steel, immersed in the solution. A sufficient length of pipe is necessary so that most of the heat is absorbed from the gas before it passes out of contact with the solution. The waste gases are easily vented and there is no necessity for raising the tank high off the floor as in the case of open heating.

Where steam is used for heating, a closed iron coil is usually installed, altho in many cases steam air injectors are employed for the agitation they provide. The coil is placed at the side rather than the bottom so that it will not become covered with sediment, and in order that there may be better circulation.

The cleaning tank should be slanted or tilted slightly and should be provided with a drain valve at the bottom. If possible, skimming troughs for the separation of floating dirt and oil from the solution and overflow dams should be installed. In up-to-date installations one usually will find ventilating ducts for the removal of vapors and some sort of lagging for the conservation of heat.

Cold rinse tanks are generally of wood or steel. The small wood tanks are made of 2 or 3 inch cypress with wrought iron tie rods and bolts. They are divided into two or more compartments by wood partitions and are constructed so that the clean water enters the first compartment and overflows into the next, leaving the last compartment by means of a brass stand-pipe overflow. Steel cold rinse tanks are suitable for chromium plat-

Fig. 3—Illustration of an industrial pipe burner.

ing installations because the chromic-acid has an inhibiting effect on the steel and rusting is minimized.

Where steam or electrical heating is available, wood tanks may be used for hot rinses. Steel tanks are employed in installations where the water is heated by gas, the addition of a small amount of sodium carbonate prevents rust. Where the final hot rinse must be kept clean, as in chemical coloring, copper, monel, and stainless steel can be used or wood tanks heated by immersion gas or electric heaters. Where steam is used, open end coils are preferable, in which case not only a drain valve but an overflow is provided.

Acid Pickling and Dipping

Various materials are used for pickling tanks, depending upon the acid, the concentration, and the temperature. For cold dilute pickles, unlined long-leaf yellow pipe tanks with monel fittings can be used. For hot pickling, stoneware tanks may be used for very small units and lead or rubber lined steel for larger installations. Lead is less expensive to install but is not very resistant to hydrochloric acid, is very heavy and does not have as long a life. Also, if the lining should develop a leak, the acid will fill the space between a lead lining and the steel shell and result in serious attack before it is noticed. Rubber linings are bonded to the steel and a hole in the lining results in only a small hole in the steel shell which serves to locate the leak and can be easily repaired.

Pickling tanks for the steel industry are almost always rubber lined. In order to protect the rubber from abrasion, acid brick sheathing is used. Because of the low thermal conductivity of the brick, the temperature of the rubber is less than that of the pickling solution and its life is extended thereby. Where rubber lining is used, an extra thickness of rubber around the top of the tank and at the solution line for protection and in addition boards are often placed around the top as shown in Fig. 5, if a brick sheathing is not provided. It has been stated that rubber lined tanks fail from the outside, due of course, to the splashing of acid and rusting of the steel shell. It is therefore a wise precaution to paint or coat the tank with an acid resisting medium and in some cases it may even be cheaper in the long run to rubber coat the outside as well as the inside.

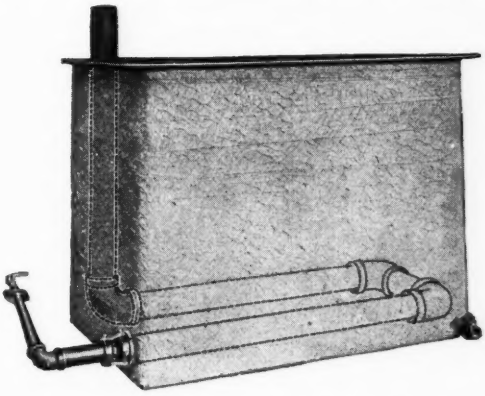

Fig. 4—Gas immersion heater shown in position installed in tank.

For use with strong oxidizing agents such as nitric acid, chromic acid or dichromate dips, rubber is not suitable and lead is commonly employed except for small units which are kept in crocks or ceramic tanks. Lead is not very resistant to nitric acid but is cheap and convenient. Although stainless steel has been employed in the manufacture of nitric

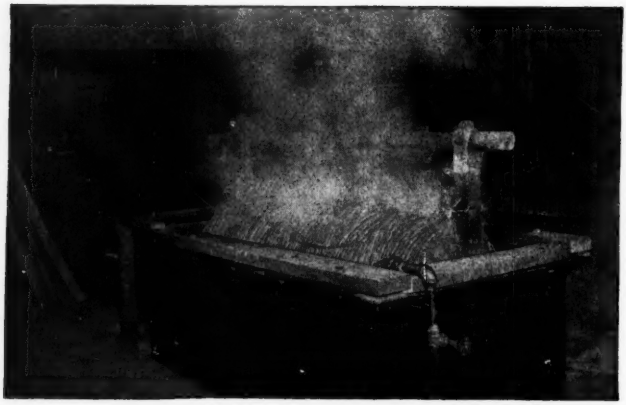

Fig. 5 — Illustration showing rubber-lined tank. Note particularly the wood planks around the rim which serve to protect the edge of the rubber lining.

acid as a material of construction for absorbing towers, it has not been favored in the plating industry for nitric acid containers, nor have the silicon iron castings found much use. Lead or silicon iron coils are used with success for steam heating, and water baths of steel construction for direct or immersion gas heating.

Strong acid dips such as bright dips, acid stripping solutions, and so on, are kept in stoneware tanks. They are usually heated or cooled by water jackets as shown in Fig 6. Concentrated sulfuric acid of 75 per cent used for stripping nickel plate is kept in lead lined steel tanks. Solutions containing hydrofluoric acid which are used for pickling sand castings and for dipping aluminum, are kept in lead lined tanks which are painted on the inside, especially at the solution line, with a mixture of 1 part beeswax and 4 parts paraffin.

Plating Solutions

Formerly wood tanks lined with asphaltum were used for alkaline cyanide solutions, in the deposition of brass, bronze, cadmium, copper, silver and zinc, but as they are more expensive than steel and are subject to leakage, they are rapidly passing into the discard in favor of unlined steel tanks. Steel is suitable for sodium stannate tin plating solutions which are too alkaline for wood containers. Steel plating tanks should never be lighter than 3/16 in. steel, even for the small units.

Very often during operation of metal tanks the current finds a path along the wall of the tank shorter than the path from anode to cathode and as a result, metal is deposited on the tank wall back of the anode. At the same time, the portion of the tank wall adjacent to the work acts as an insoluble anode and the solution becomes depleted in metal. This condition is eliminated by placing sheets of wire glass behind the anodes.

Steel tanks lined with 6 per cent antimonial lead are used for chromium plating, often with wire glass to insulate the lining from the anodes and work. This type of lining requires a periodic anodization for best results, which is carried out by connecting the lining to the anode bar and passing current through the solution for an hour or two. It is claimed that tellurium lead does not require this treatment. Unlined iron tanks have been used for this purpose but the practice is not recommended because the iron dissolves and contaminates the solution besides shortening the life of the tank itself.

Acid zinc and acid copper solutions

are contained in rubber or lead lined steel tanks according to the latest practice but asphaltum lined wood is also employed to a large extent. Nickel and lead solutions which are operated at room temperatures are most often kept in asphaltum lined cypress tanks. They are kept warm in winter by means of lead steam coils or electric immersion heaters. Rubber lined tanks are employed for hot nickel solutions which are used in modern plants for rapid plating. The chlorides which must be present for proper anode corrosion and the elevated temperature results in the attack of lead linings. It is of the utmost importance that the correct type of rubber be used, since contamination of nickel solutions by leaching of the chemicals used in compounding or the accelerators used in vulcanizing the rubber is often fatal. The large rubber companies have developed special linings for the plating industry which may be used with complete safety. A tank equipped with such a lining is shown in Fig. 7. Rubber lined tanks and stoneware are the only materials of construction which have been found practicable for iron plating from the acid chloride solution which is the most common. Stoneware is limited to rather small installations because of difficulty in fabricating and handling. It is difficult to heat to the temperature of 185 to 210 degrees F. required for this process.

Precious metal plating, including gold, platinum and rhodium is carried out in heat resistant glassware, enameled ware and stoneware. The enameled ware should be vitreous. This is preferable because it combines the strength of steel with the chemical resistance of porcelain. It can be heated more easily than stoneware but does not offer as good resistance to acids and oxidizing solutions. It is safer because it is far less sensitive to change in temperature which may cause cracking of stoneware with consequent loss of the solution and is at the same time more resistant to shock than glass. Enameled ware is much favored as a container for dip lacquers in which field it shares popularity with containers of steel or wood, lined with block tin.

The applications recorded above are those of present practice in the plating industry. There are other materials of construction which have important advantages but because of many reasons, have as yet been re-

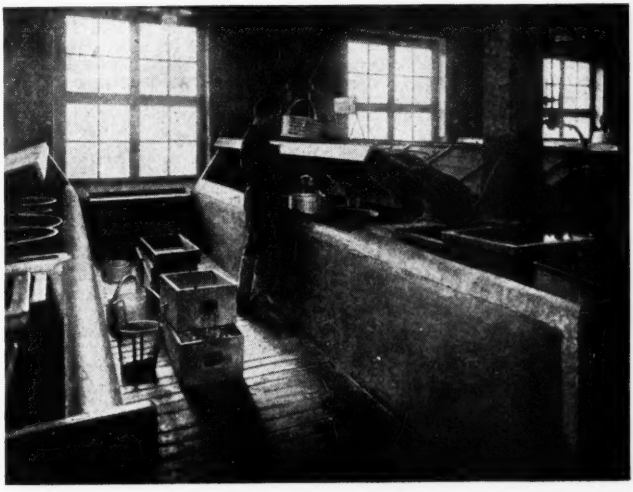

Fig. 6 — Illustration showing an acid dipping installation.

stricted to very special conditions. Among the materials in this group may be mentioned the steels clad with monel metal, nickel and stainless steel. Non-metallic materials which have found application are acid brick laid with acid-proof cement, carbon and carborundum blocks, concrete, Haveg, and other synthetics.

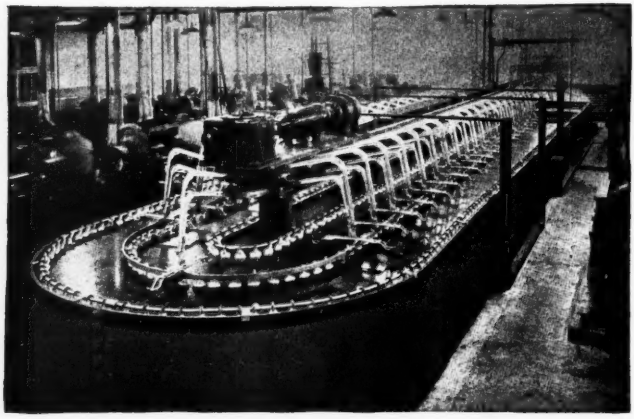

Fig. 7—An automatic rubber-lined plating tank.

Gehnrich Industrial Ovens Bulletin. The Gehnrich Corporation, 42 Thirty-fifth St., Long Island City, N. Y., manufacturers of improved baking ovens for japanning, enameling, lacquering, and synthetic resin finishes, is now offering a 2-page bulletin entitled "If You Seek The Ultimate in Baking Finishes". The bulletin is well illustrated, showing installation for the various finishing operations.

The Gehnrich ovens offer insulated "Dual Panel" assembly, a patented, exclusive Gehnrich feature which insures maximum heat retention and minimum thermal losses through walls, roof and doors, in addition to the coolest possible outside wall temperature. The units are of scientific, sturdy construction and have correct fuel selection and heat application. The units also offer heat convection and circulation to assure uniform heating, regardless of loading conditions, size, shape and quantity of work and operating temperature. A safety operating system which interlocks ventilation with the heat source insures effective draft and purging of the ovens of explosive vapors before ignition. The loading or material handling system conforms with the rate of production, character of product, with interlocking processes and space available. Minimum obsolescence is assured due to the ease of erection, alteration, and moving for changed manufacturing conditions. The units utilize gas, oil, electricity or steam for heating. A copy of the above bulletin describing the above operations in more detail will be sent upon request.

American Nickeloid Crimped Coils Bulletin. The American Nickeloid Company, 1 N. Second St., Peru, Ill., is now issuing a bulletin describing pre-crimped and prefinished American Bonded Metal and to which is attached sample. Ordinarily, the metal must be stamped to form the workpieces, then crimped, and plated, and then buffed. With American Bonded Metals there is only one operation. The metals come to you in coils, in all standard widths and lengths, pre-crimped and prefinished, and ready for the stamping or forming operations.

The prefinished crimped metal can be used for trim and decoration, panelling, table edges, displays, window interiors, and for toys and novelties of all kinds. A copy of the bulletin together with sample will be sent upon request.

Abrasive Products Booklet. Abrasive Products, Inc., South Braintree, Mass., is now offering a 36-page booklet in which its Jewel Brand abrasive products are described. Jewel Brand abrasives are listed in specification tables in which sizes, grits, and prices are given. All of the abrasive products listed in this book are said to conform with the recommendations of the Division of Simplified Practice of the United States Department of Commerce. Copy free upon request.

Modern toys are ruggedly constructed to withstand all the hard knocks and rough use they invariably get from children. But rugged construction alone is not enough. Toys need a rugged finish, too—a finish that stands up under all the ordinary handling of manufacture and shipping, as well as under the extraordinary wear and tear after they are sold. In short, toys need a tough A. & W. "Tailor-Made" finish. Manufacturers of all types of metal equipment—toys, furniture, partitions, containers, closures—now use A. & W. "Tailor-Made" on their products to improve their appearance and wearing qualities. Call in the A. & W. man to help you end your finishing troubles.

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Analysis and Control of Silver Plating Solutions

By Dr. B. Egeberg and N. E. Promisel
International Silver Co., Meriden, Conn.

In a previous installment on silver plating, the functions of the various constituents of a silver plating bath were described and the effects on the properties of the solution of varying the concentrations of the individual ingredients were pointed out. For satisfactory operations of the bath and satisfactory deposits, it was evident that the silver and free cyanide content of the bath must be controlled. The content of the third principle component, carbonate, was not of critical importance unless its concentration became too great, in which case undesirable plating effects would become manifest. It is usual, therefore, not to analyze for carbonate in silver plating solutions as often as for cyanide or for silver, but nevertheless, a periodic analysis for this compound is advisable to ensure the solutions being within proper bounds and to be forewarned sufficiently of any unexpectedly large accumulation of this material.

Besides the three main components of the bath, carbon disulfide is added for brightening purposes. The accurate analysis of the small amounts used is not easy, nor would the information, even if available, be of particularly great help since its use is so empirical. No attempt is made, therefore, to analyze this. Ammonia is also added occasionally for brightening purposes and a few of the older platers favor furthermore the presence of free caustic. The use of the latter is rare, however, but in the case of the former, analysis is occasionally desirable especially since ammonia is formed in any event from decomposition of the cyanide.

In addition to these deliberate additions, other elements or radicals might be present as impurities. Formerly, baths were made from silver chloride, or chloride might be dragged in from preceding acid rinses. Similarly, sulfate might also be brought into the solution. Since iron tanks are almost universal for silver plating solutions, this element is usually present if only in small amounts, as ferrocyanide, especially if appreciable chlorides exist. It is mainly in connection with the latter that analytical interest in chlorides centers, since if the iron content of the bath reaches too high a value, stained or discolored deposits are obtained. Since the basic metals plated with silver are usually copper, brass, nickel, or nickel silver, the quest for impurities should also include copper, zinc, and nickel.

To summarize then, for correct control of silver plating solutions, analysis of the silver and free cyanide should be made at frequent intervals, and less often, of carbonate. In addition, periodical analysis of sulfate, chloride, iron, copper, nickel, and zinc are desirable. It might also be desirable to determine am-

monia and caustic, especially if these have been deliberately added, but the necessity for this is so rare that their determination does not warrant discussion and consequently will not be included here. A reference at the conclusion of the paper will be of assistance in this connection.

Strike solutions may be analyzed in a manner identical to that for plating solutions. In the case of strikes, usually only the silver and free cyanide are important. These solutions are discarded very much more frequently than plating solutions so that impurities cannot so easily accumulate in them. They differ from plating solutions also in that the silver content is very low and the free cyanide is relatively high. Usually they are made with sodium salts, whereas in the case of plating solutions, potassium salts are more often used. The methods of analysis described below are not affected by either.

In the methods to be described, only one method for a particular variable will be given to avoid confusion, and this method will be one primarily intended for industrial control, rather than for research purposes. As such, it is implied that the methods are as simple and rapid as possible, though not necessarily as accurate as possible, since extreme accuracy is never needed for control purposes.

Determination of Silver

This method, referred to as the Volhard method, depends on the conversion of the silver cyanide complex to silver sulfate with the destruction of all the cyanide, and the precipitation, by titration, of the silver with potassium thiocyanate. Ferric alum is used to indicate, by an intense red coloring, when excess thiocyanate is being used, that is, when all the silver has been titrated.

To a ten milliliter sample of plating solution in a 300 milliliter Erlenmeyer flask are added 10 cubic centimeters of concentrated sulfuric acid. This should be done in a hood with good ventilation since poisonous hydrocyanic acid gas is liberated. The solution is then boiled vigorously until heavy dense white fumes of sulfur trioxide are copiously given off. The flask is then removed from the heater, allowed to cool, and carefully diluted to at least 150 milliliters. The solution, if not clear, may be boiled for a few minutes. After cooling, two milliliters of indicator solution are added and the solution titrated with tenth normal (9.718 grams per liter) potassium thiocyanate until a pink tinge appears. The indicator is a 10 per cent solution of ferric ammonium sulfate containing just enough nitric acid to discharge the brown color.

Calculation:

(milliliter Potassium Thiocyanate) X (silver value of 1 milliliter) X 12.17 = troy ounces silver per gallon.

Example:

milliliter potassium thiocyanate used in titration 25.0; 1 milliliter potassium thiocyanate equivalent to 0.01236 gram silver by standardization.

25.0 X 0.1236 X 12.17 = 3.75 troy ounces silver per gallon.

Determination of Free Cyanide

This determination depends upon the conversion of silver nitrate, which is added to the solution, to soluble potassium, or sodium, silver cyanide as long as there remains free cyanide, after which a drop of silver nitrate precipitates silver cyanide. Occasionally, for greater accuracy, or where impurities present are quite high, or where an end point is difficult, a few milliliters of normal (166

grams per liter) potassium iodide are added to the solution before titrating, but for most industrial work this is unnecessary.

To a 5 milliliter sample of the plating solution in a 300 milliliter Erlenmeyer flask are added about 100 milliliters of water. This solution is titrated over a black background with tenth normal (16.989 grams per liter) silver nitrate until a permanent turbidity appears.

Calculation:

(milliliter silver nitrate) X (cyanide value of 1 milliliter) X 26.7 = avoirdupois ounces of free potassium cyanide per gallon.

(for sodium cyanide use 20.1 instead of 26.7).

Example:

milliliter silver nitrate used in titrating 12.0 1 milliliter silver nitrate equivalent to 0.013 grams potassium cyanide by standardization.

12.0 X 0.13 X 26.7 = 4.16 avoirdupois ounces free potassium cyanide per gallon.

Determination of Carbonate

In this procedure, the free cyanide is "fixed" with silver and the remaining alkalinity, due to carbonate, is titrated with acid.

To the sample after the titration for free cyanide, are added two drops of phenolphthalein solution, and the whole titrated with two normal (about 42 cubic centimeters concentrated acid per liter water) hydrochloric acid until only a pale, pink color just persists.

Calculation:

(milliliter acid) X potassium, or sodium, cabonate value of 1 milliliter X 26.71 = avoirdupois ounces of potassium, or sodium, carbonate per gallon.

Example:

milliliter acid used in titrating 4.6 1 milliliter acid equivalent to 0.069 gram potassium carbonate by standardization.

4.6 X 0.069 X 26.71 = 8.47 avoirdupois ounces potassium carbonate per gallon.

Determination of Sulfate

For the determination of sulfate, the excess cyanide is destroyed and the silver precipitated by hydrochloric acid and filtered off. The sulfate may then be precipitated by barium chloride and weighed after drying as barium sulfate.

To a 25 milliliter sample of plating solution in a 250 milliliter beaker is added an excess of concentrated hydrochloric acid. This should be cautiously done in a thoroughly ventilated hood. The solution is digested down to a small volume, diluted a little, and filtered. To the filtrate, diluted to about 200 milliliters, is added an excess of a 10 per cent solution of barium chloride and the beaker allowed to stand until the supernatant liquid is clear. The precipitate is then filtered into a Gooch crucible, dried at 110 deg. C, and weighed.

Calculation:

Weight of precipitate X 3.98 = avoirdupois ounces potassium sulfate per gallon.

Weight of precipitate X 2.44 = avoirdupois ounces sodium sulfate per gallon.

Example:

Original weight of crucible 15.2012 grams.

Final weight of crucible 15.2052 grams.

(15.2052 — 15.2012) X 3.98 = 0.015 avoirdupois ounces potassium sulfate per gallon.

Determination of Iron

To determine iron, the cyanide is detroyed with nitric acid and iron (ferric) hydroxide precipitated with ammonia. This is burned to iron oxide and weighed.

To a 25 milliliter sample in a 250

milliliter beaker are added 10-20 milliliters concentrated nitric acid and the solution digested to a small volume. (Caution: This should be done under a hood with good draft.) After cooling and diluting to 150 milliliters, the solution is made ammoniacal and the precipitate coagulated by boiling. After filtering and washing, the precipitate is burned to constant weight.

Calculation:

Weight of ignited precipitate X 3.73 = avoirdupois ounces iron per gallon.

Example:

Original weight crucible 15.0021 grams.

Final weight crucible 15.0101 grams.

(15.0101 — 15.0021) X 3.73 = 0.03 avoirdupois ounces iron per gallon.

Determination of Chloride

After removal of the iron, the filtrate is acidified whereupon the silver precipitates the chloride which is filtered and weighed as such.

The filtrate from the iron determination is slightly acidified with nitric acid and the precipitate coagulated by boiling. After settling, it is filtered into a weighed Gooch crucible and dried at 110 deg.

Calculation:

Weight of precipitate X 2.77 = avoirdupois ounces potassium chloride per gallon.

Weight of precipitate X 2.18 = avoirdupois ounces sodium chloride per gallon.

Example:

Original weight crucible 10.2001 grams.

Final weight crucible 10.2815 grams.

Sodium strike solution.

(10.2815 — 10.2001) X 2.18 = 0.18 avoirdupois ounces sodium chloride per gallon.

Determination of Copper.

For the determination of copper, the remainder of the silver in the filtrate from the chloride determination is precipitated with hydrochloric acid and filtered off, and the copper, after conversion to sulfate, is electrolyzed.

To the filtrate from the chloride analysis is added enough hydrochloric acid to precipitate all the silver, which is then filtered. To the filtrate are added 5 milliliters concentrated sulfuric acid and the solution evaporated to heavy, dense white fumes. After cooling and diluting with 50 milliliters water, the solution is electrolyzed with a weighed platinum cathode and rotating anode at 2 amperes for 20 minutes. The solution level is then raised to determine if all the copper has been deposited. If so, the cathode is rinsed in water and then in alcohol, dried, and weighed.

Calculation:

Weight of copper X 5.34 = avoirdupois ounces copper per gallon.

Example:

Original weight cathode 15.001 grams.

Final weight cathode 15.1274 grams.

(15.1274 — 15.1001) X 5.34 = 0.14 avoirdupois ounces copper per gallon.

Determination of Nickel

In this determination, nickel is precipitated with dimthylglyoxime from the solution electrolyzed for copper.

To the electrolyzed solution from the preceding determination ammonium hydroxide is added until the solution is just ammoniacal. An excess of 1 per cent alcholic dimethylglyoxime is added and the solution heated to just below boiling for 10 to 15 minutes. The red precipitate is filtered into a Gooch crucible,

washed with hot water, dried at 110 deg. C and weighed.

Calculation:

Weight of precipitate X 1.08 = avoirdupois ounces nickel per gallon.

Example:

Original weight crucible 10.2401 grams.

Final weight crucible 10.2451 grams.

(10.2451 — 10.2401) X 1.08 = 0.005 avoirdupois ounces nickel per gallon.

Determination of Zinc

Zinc may be plated from the above filtrate after conversion to sulfate and with additions of alkali.

To the filtrate from the nickel determination, concentrated sulfuric acid is added until the solution is distinctly acid. It is heated until white, heavy, dense fumes are liberated, then cooled and diluted with 100 milliliters of distilled water. It is best to filter at this stage. After addition, sodium hydroxide is added until the solution turns red. The latter is then electrolyzed for zinc at 1 ampere using a weighed copper plated platinum cathode and rotating anode. After 15 minutes, the solution level is raised to determine if all the zinc has been deposited. If so, the cathode is raised, without breaking the electrical circuit and with continual washing. It is then dried and weighed.

Calculation:

Weight zinc X 5.34 = avoirdupois ounces zinc per gallon.

Example:

Original weight cathode 10.4750 grams.

Final weight cathode 10.4900 grams.

(10.4900 — 10.4750) X 5.34 = 0.08 avoirdupois ounces zinc per gallon.

For auxiliary methods of analyzing silver plating baths and for a fuller discussion than is within the scope of this paper, the reader is referred to a paper by R. M. Wick in Bureau of Standards, Journal of Research, Vol. 7, pp 913-933, 1931.

Catalog No. 42-A of U. S. Electrically Driven Drills, Grinders, Buffers, and Flexible Shaft Machines. The 70 pages in this catalog, now being issued by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio, comprise a complete exposition of the electrically driven mills, portable electric polishers, disc sanders and surfacers, portable surface grinders, utility bench and floor grinders, portable electric saws, electric screw drivers, portable high speed grinders, center grinders, internal grinders, ball bearing bench and floor grinders, combination grinders and buffers, bench and pedestal polishing machines, buffing machines, flexible shaft machines of various types, attachments, abrasive and rag wheels, rotary files and rasps and other machines and accessories made by this firm.

Each tool is fully described and illustrated and complete specifications are included giving all the necessary sizes, dimensions, and so on. Copy free upon request.

Herrington & Randall Industrial Oven Bulletin No. 36.1. This four-page bulletin now being issued by Herrington & Randall, Inc., 13700 Sherwood Ave., Detroit, Mich., describes and illustrates the Herrington & Randall type oven. The engineers of this company are said to be equipped to meet the demands of practically any industrial oven installation. Copy of Bulletin No. 36.1 free upon request

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In the May issue of PRODUCTS FINISHING *Mr. Robert T. Griebling of the Aluminum Company of America presents the first of a series of articles offering timely and valuable information concerning various phases of the finishing of Aluminum.*

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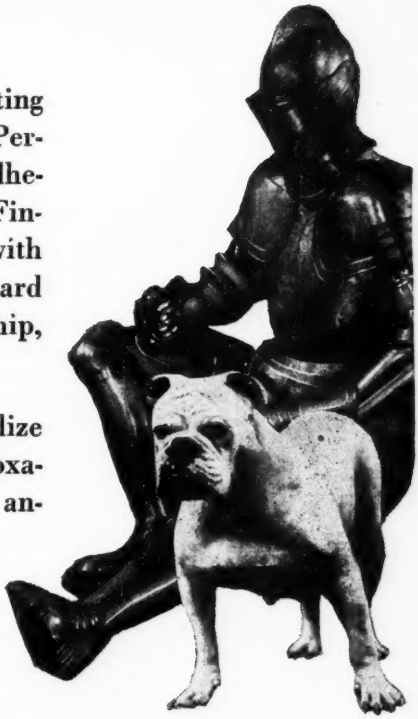

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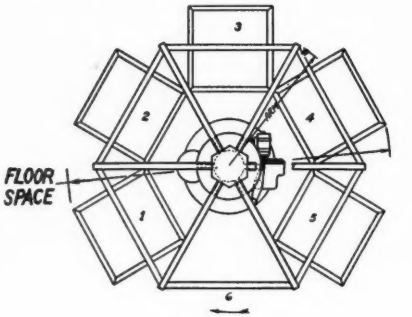
Bullard-Dunn Process

In this article the author describes the equipment, materials, and the method employed in this unique descaling process.

By Edwin Smith

IN MANY factories where the presence of scale on heat treated machine parts has caused endless annoyance, especially in subsequent grinding operations, various attempts have been made to remove the scale, but only at the expenditure of a great amount of money. Heat-treating in an inert atmosphere has been tried and is successful in some instances, but as a general rule, this method introduces engineering problems of a high order.



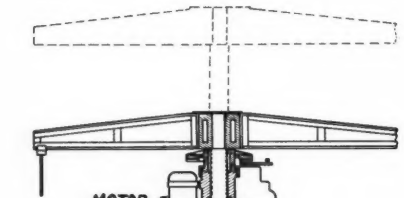


Fig. 1—(Above) Layout of a six station type conveyor. The tanks are placed in the sequence as follows: alkaline electrocleaning, water rinse, electrolytic acid descaling, cold water rinse, hot water rinse, and unloading station. (Below) Drawing showing a cross section of a six station type conveyor.

Pickling in acid has been used for a long time and because of long familiarity many defects of the process have been eliminated in the design of the parts or in other operations. Scratch brushing is also used in many places. However, scratch-brushing does not always eliminate all of the scale and entails much manual labor.

In the Bullard-Dunn Process of Descaling, a method has been worked out which completely eliminates the scale without attacking the underlying metal. This is accomplished by electro-depositing the bare metal with a thin but impervious coating of tin as soon as the scale is removed.

Parts to be descaled are first degreased in a solvent degreaser and are then put through the following cycle:

1. As anode in electrolytic alkali, (Commercial cleaner 2 to 3 oz. to a gal.) Temperature 200 deg. F. to remove remaining grease, handling marks, and dirt.
2. Cold water rinse.
3. Descaling in a solution containing 10 per cent by volume of 68 deg. Baume sulfuric acid.

25 ounces per gallon Glauber Salts. 15 ounces per gallon glue. Temperature 140 deg. to 150 deg. F. work or cathode current density 60 amperes per square foot. Voltage 4-5.

4. Cold water rinse.
5. Hot water rinse.

At the Bullard plant a three-minute operating cycle is employed.

If for some reason, for instance, before plating with some other metal, it is desired to have the parts free from tin, after the cold water rinse No. 4, the parts are introduced into a second electrolytic alkali tank and treated as anode to remove the tin. A cold water rinse and a hot water rinse then follow. Parts may be transferred from one tank to the next by hand or by any suitable type of conveyor.

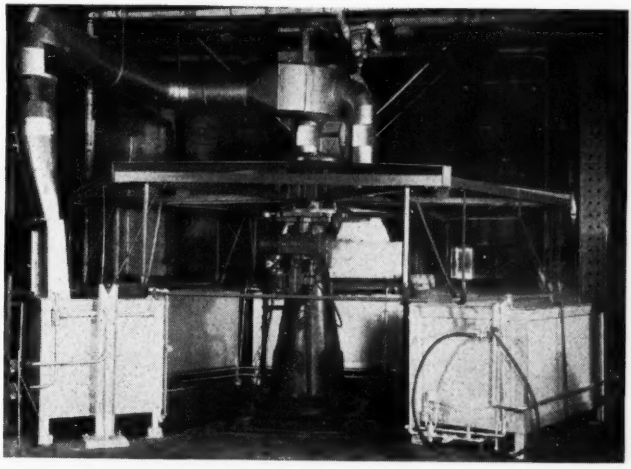


Fig. 2—Illustration of a six station conveyor with the ram in the low position and the work bars at rest on their insulated supports at the electrolytic alkali and acid descaling tanks.

The Bullard Full Automatic Station Type Descaling Machine employs a clever adaptation of the principle made famous in the Bullard line of Multimatic Machine Tools. The required number of tanks, five in the six station model and seven in the eight station model, are arranged in an open circle leaving a space the length of one tank free to be used as a loading station. In Figure 1 is shown layout of a 6 station machine.

A hollow pedestal is placed in the center of the circle. A ram operates through the pedestal. To the upper end of the ram a frame work is attached which extends over the tanks. Fastened permanently to the frame work are v-shaped hangers supporting removable rods on which the work is suspended by means of wires, hooks, racks or baskets. When the ram is in the lower position, the point of the v's just clear the tops of tanks as shown in Fig. 2. The ram in the upper position is shown in Fig. 3; the lower ends of the racks clear the tops of the tanks and the ram can be rotated without interference in carrying the racks from one station to the next.

A No. 9 Station Type Conveyor is designed to carry a maximum load of 9000 lbs. distributed equally on the work bars hanging from the circumference of the frame. The No. 3 machine is intended for lighter work and can carry a maximum load of 3000 lbs. Both types are entirely automatic in operation. Oil pumped into the hydraulic cylinder raises the

ram to the high position. At this point the ram turns, indexing the racks of work from the one tank to the next. When the rotary motion ceases, oil is exhausted from the hydraulic cylinder into the reservoir contained in the hollow pedestal, allowing the ram to descend, thus plunging the racks into the solution. This operation proceeds automatically, with any desired time in the low position.

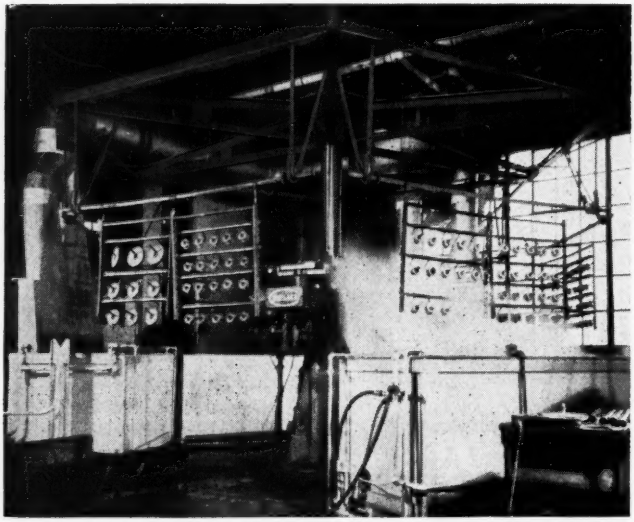


Fig. 3—Illustration of a six station type conveyor in the raised position, ready for indexing to the next position.

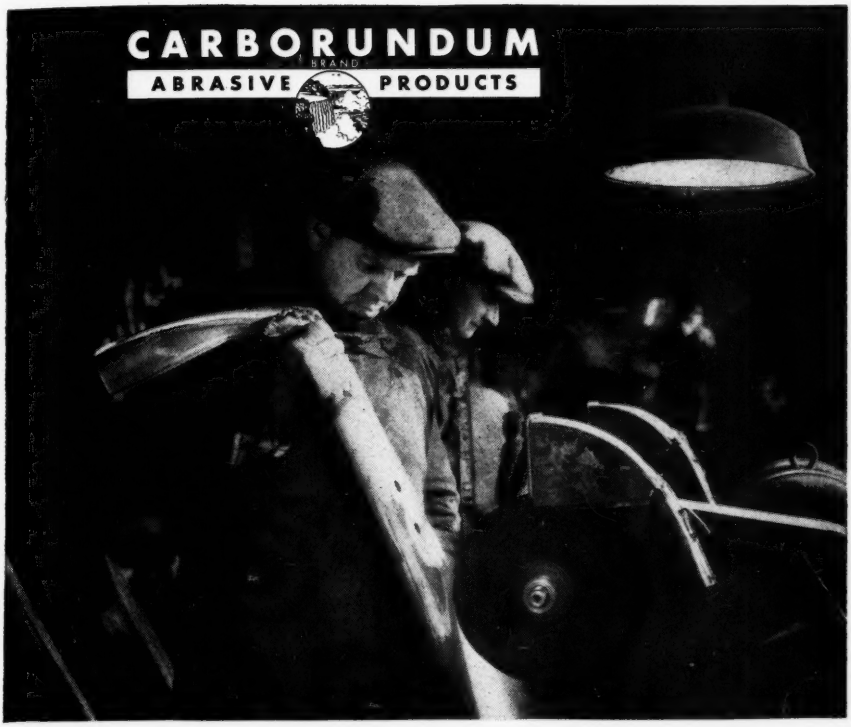
In normal descaling operations parts are treated as follows:

1. Alkaline electroclean.
2. Water rinse.
3. Acid descaling electrolytic.
4. Cold water rinse.
5. Hot water rinse.
6. Unload.

The tanks may be made in sizes to meet many requirements. In the machines shown in the illustrations the tanks are 6 feet long, 3 feet wide, and 3 feet deep. In a special installation, the tanks were made 7 feet long, 4 feet wide, and 4¾ feet deep. Machines of this type have been built with tanks up to 9 feet in length.

All of the tanks are of welded steel construction and are heavily reinforced at all edges. The No. 1 tanks containing Alkali cleaner and the Nos. 2 and 4 containing cold water are unlined. The No. 3 tank which contains the acid descaling solution is lined with rubber and the No. 5 which contains hot water is lined with lead.

When in operation, both the electrolytic alkali and the acid solutions give off a spray. This spray is carried away by an exhaust system. As shown in the illustration Fig. 2, the exhaust hood is placed at the outside edge of the tanks. The duct leads up so as to clear the frame and hangers. Under normal circumstances very little difficulty is experienced from steam escaping from tank No. 5 which contains hot water. If it should be desired to exhaust this tank also, a hood similar to that shown on tank No. 1 in Fig. 2, could be installed and the duct carried over to connect with the main duct at the rear of the machine above the acid descaling tank. Just above the pedestal in Fig. 2, may be seen the box to which the exhaust ducts lead. The exhaust fan with directly connected motor is located behind the box. The exhaust may lead directly to the outer



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air or may be led first over a series of baffle plates in order to collect entrained moisture. All interior parts of the exhaust system which are subjected to the action of acid fumes are protected by a coating of acid proof paint.

Two 1000 ampere 6 volt, motor-generators are located at the rear of the machine where they are out of the way of the operators but still readily accessible. One of the generators is connected by means of bus bars to the left side of Tank No. 1 in Fig. 2, the electrolytic alkali tank. A noteworthy feature here is the manner of supporting the loaded work rods on standards at each end of the tank. These standards are insulated from the tank and connection to them is made from the positive bus bar. The v-shaped supports on the standards are at such a height that the work rods are entirely free from the hangers when electrolytic action is taking place. Thus, there is no opportunity for shortcircuiting, should the insulating rubber pads on the hanger be splashed with alkali or acid.

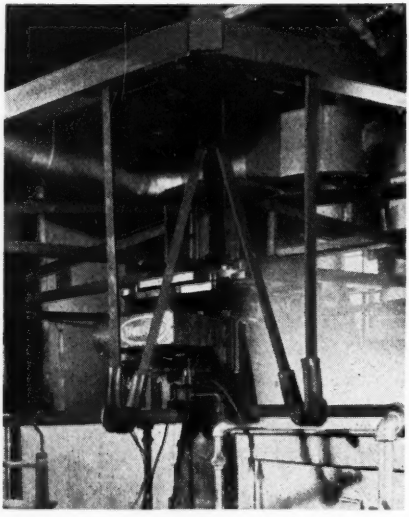

Fig. 4—A close-up view of two hangers showing the insulators at the bottom of the v-type construction.

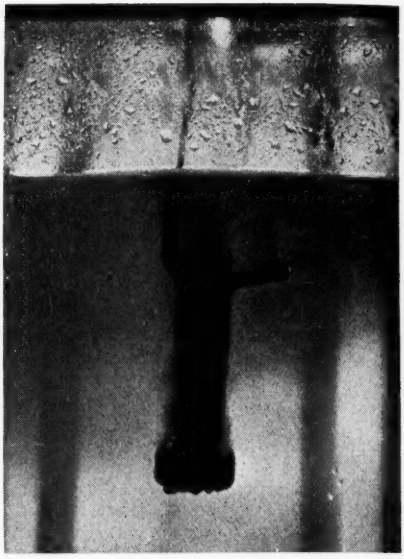

Fig. 5—During the descaling process, hydrogen is formed on the surface of the work beneath the scale by the decomposition of the electrolyte and thus tends to loosen the scale. At the same time, tin is deposited on the bare steel, thus protecting the surface from an acid attack.

The second 1000 ampere generator is connected through a similar pair of bus bars and standards to the acid descaling tanks. Here the standards are connected to the negative bus bar. It is possible to use a single motor-generator and, by means of a rheostat, provide the amount of current necessary in each tank. However, experience has indicated that the proper control of conditions in each of the tanks is much simpler if separate sources of current are used for each tank.

While the optimum temperature of operation is not particularly critical in any of the heated tanks, the Bul-

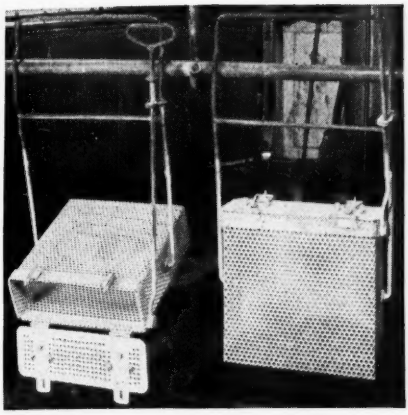

Fig. 6—Small parts are handled successfully in metal baskets. The baskets become coated with tin in the descaling tank but this is subsequently removed in the alkali tank.

lard engineers prefer to relieve the operator of as much detail work as possible and so have incorporated temperature controllers in the design of alkali tank No. 1, acid tank No. 3, and the hot water tank No. 5. The extra cost of these controllers is negligible compared to the damage which might be caused by alkali or acid tank boiling over. Tests have also indicated that less steam is used even on the hot water tank than when the controls are operated by hand.

In the preceding paragraph it was stated that the optimum temperatures were not critical. This is particularly true of the descaling operation and holds for other factors as well as for the temperature. The acid content may vary considerably and the current density may vary within rather wide limits.

The acid solution is made up to contain 10 per cent by volume of 66 deg. Baume sulphuric acid; 25 ounces Glauber Salts per gallon is added to increase the conductivity; and .15 ounces per gallon of glue is added to aid in the deposition of tin, and to check spray loss.

The anodes are special castings of a high silicon iron with one or two anodes of tin. As articles are descaled, part of the scale goes into solution as ferrous sulphate and part drops to the bottom of the tank. At the end of each day's operation it can be removed. Fresh acid must be added from time to time to take the place of that consumed. Whether the sulphuric acid content varies eight to ten per cent apparently makes little difference in operation except that it changes the conductivity of the solution. Likewise there appears to be no limiting factor in the concentrations of ferrous sulphate, short of saturation.

When the accumulation of ferrous sulphate reaches saturation, the tank may be cooled to allow the salt to crystallize, or the saturated solution may be drawn off to another tank for crystallization. The mother liquors left from the crystallization is re-

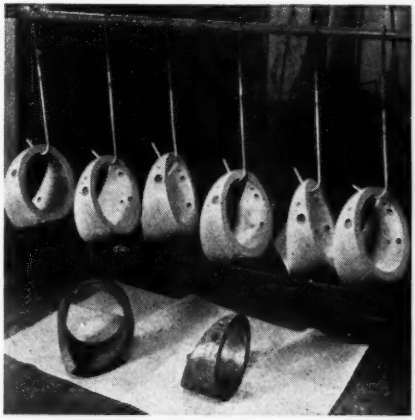

Fig. 7—Heavy parts are supported from the work rods by means of hooks. The parts shown in the illustration are hanging from the work rods and have been through the process and are covered with a tin coating. The two parts on the floor in the foreground have not yet been descaled.

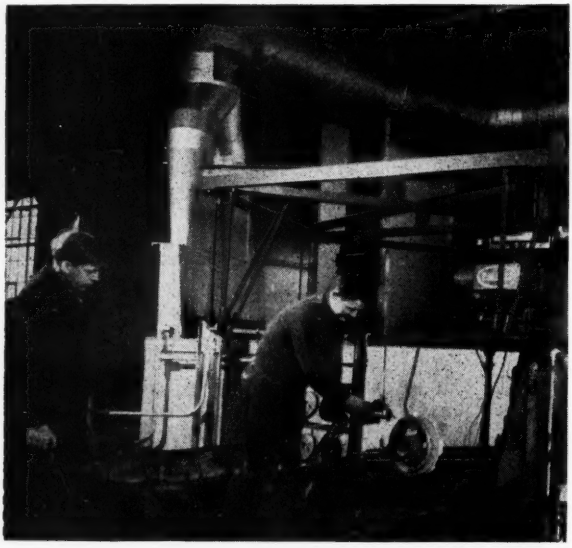

Fig. 8—The man in the left of the illustration is at the controls which permit either automatic or manual control of the movement of the machine. Note particularly the heavy machine forgings hanging from the work bar. Pats up to 500 lbs. in weight can be handled on this machine.

turned to the descaling tanks and the solution brought to standard volume by the addition of sulfuric acid, Glauber salt, glue, and water.

This is particularly advantageous in situations where it is difficult to dispose of spent pickling acid without damage or running afoul of local health and conservation laws. It provides a method of converting all of the sulfuric acid to a solid marketable form without the necessity of conducting extensive concentrating operations on a particularly corrosive solution.

This is all on the assumption that the electrolyte is maintained in the ferrous state, a rather difficult thing to do, and one much sought for in several industries, until the discovery was made that anodes containing silicon in the form of a high silicon iron alloy were effectual in preventing the oxidation of the anodes. After a very short period of operation they become coated with a thin porous coating of silica which acted as a diaphragm and prevented oxygen liberated at the anode from oxidizing the iron in the solution.

The time of electrolyzing in the descaling tank may be varied depending on the character and thickness of the scale. In the Bullard plant where descaling operations are conducted largely on heat treated alloy steel, a three-minute cycle has been found most effective. If, for some reason, all of the scale has not been removed on some of the parts during the operation, the cycle is repeated until all scale is removed. A repetition of the 3-minute cycle in this manner is considered more desirable from an operating standpoint than continually shifting the controls to change the time of the cycle. A second trip through the descaling tank is usually all that is needed.

The Bullard Company uses the descaling operations primarily to eliminate heat treatment scale from parts which are to be subsequently ground. On some internal grinding operations the saving in time has sometimes reached 90 per cent. The savings in time means a corresponding saving in direct labor and shop overhead cost. The data also indicates that the average life of grinding wheels is more than doubled in many instances.

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All of the data point to extraordinary savings in the cost of grinding operations when the parts have first been descaled. In addition to the direct savings noted, one must also consider the savings effected by eliminating dimensions of the part. This process is particularly useful for descaling in such situations.

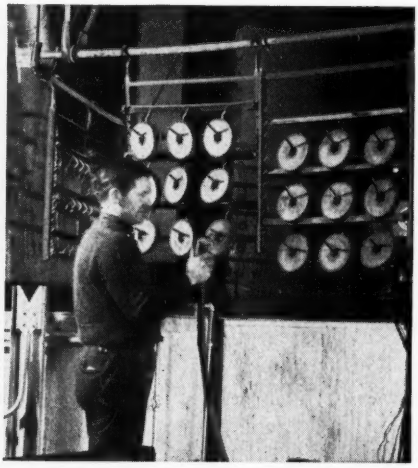

Fig. 9—After the hot water rinse, the parts arrive at the unloading station. During the three-minute interval allotted to unloading, the operator removes the remaining water by means of a compressed air jet and replaces the descaled parts with untreated work.

One of the difficulties attending trimming operations is to protect the pickled surface of sheet iron from oxidation during transfer from the drying ovens to the trimming baths. The Bullard-Dunn Process provides an excellent means of overcoming this difficulty. The thin layer of tin on the descaled sheet is said to form an alloy with the steel during the subsequent hot-trimming operation, and to form a more nearly perfect surface of tin than can otherwise be obtained.

The process is used extensively in preparing steel surfaces for Parkerizing and Bonderizing where the non-pitting features of the descaling process are of particular importance. The process is also finding extensive use in descaling drawing dies, dies for die casting, zinc alloys and aluminum alloys. It works particularly well in cleaning work of this nature which may contain deep cavities, the descaling action reaching to the extreme bottom of even small holes.

In some types of plastic molding, particularly in the rubber industry, the temperatures used soon cause a thin scale to form on the molding surface, and the molds pick up particles of rubber. The process is being used quite successfully for cleaning rubber molds and at the same time removing the thin scale without effecting any dimensional changes in the mold cavity. The resultant layer of tin acts as a protective coating during subsequent molding operations.

An interesting development has been the use of the Bullard-Dunn process as a finishing process for commercial articles. In the manufacturing operations of rock drill bits the final heat treatment leaves the bit covered with a thick but rather porous scale which does not protect the bit from rusting during storage. The Bullard-Dunn process is now being employed to remove the scale and it has been discovered that the thin layer of tin is a very good protection against rusting, and gives the bit an attractive appearance.

Bull Dog Grip Borolon Polishing Grain is the title of a folder dealing with the preparation and uses of Borolon polishing grains. The folder is being issued by Abrasive Company, Tacony & Fraley Sts., Philadelphia, Pa. Instructions are given for setting up polishing wheels with Borolon polishing grains to obtain the best results. Copy free upon request.

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NORTON ABRASIVES

Barrel Burnishing of Metal Products

Third Article of Series — Factors in the Selection of Metallic Burnishing Materials.

By H. Leroy Beaver

ANY discussion of Metallic Burnishing Materials, of necessity, takes us back to the first use of a steel product and this was by Edmunds in England about 1902 or 1903. In the previous History of Barrel Burnishing published in the February issue of Products Finishing, it will be remembered that pebbles and small pieces of crushed stone were the first medium used. The story of the first use of steel balls by Edmunds was that, in seeking a more durable and satisfactory material for carrying out his process and one that would embrace the greatest elements of permanency in that it could be used over and over again, he hit upon rejected steel bearing balls or cycle balls as they were termed at that time. The Hoffman Manufacturing Company of Chelmsford, England, were at that time the largest manufacturers of steel balls. It was from this source that the first steel burnishing balls came, and the reason for their use at that time undoubtedly was due to the fact that they were the most readily available form of material that offered the permanency he sought. The use of round steel balls has been followed down through the years and with only sporadic attempts to originate any new and more effective burnishing mediums.

In many discussions on the subject of proper burnishing materials, the argument advanced by this writer has always been that neither in theory nor practice could a round ball be forced to burnish into any angle or groove smaller than its own diameter. Inasmuch as the majority of metal products susceptible to finishing by the barrel method, and especially stampings, have such angles and grooves, something more or different than a round ball is required to satisfactorily complete the process, whereas round balls perform only a certain part.

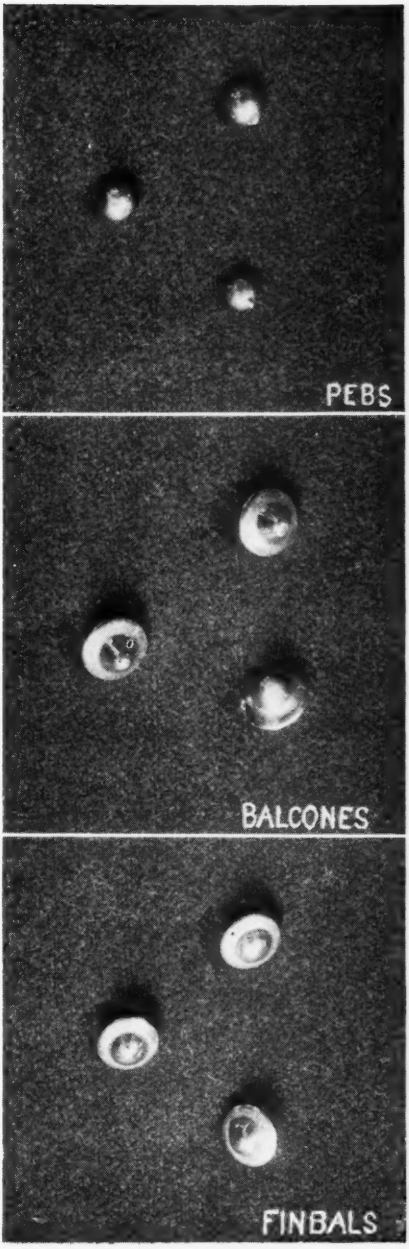
This thought or line of reasoning was not original with the writer, for we have a record that Wenger in England in 1912 recognized the inadequacy of round balls, and he turned conical forms from ¼-in. round steel rods. Being a lathe or automatic screw machine job, the cost of these conical forms was prohibitive for general burnishing use. George E. Abbott saw these conical forms while in England and upon his return about 1918 developed a double burnishing cone which consisted of two conical sections bisected by a projecting fin.

Before this, in 1915, Thomas A. DeVilbiss of Toledo, Ohio, secured a patent on a steel burnishing form conceived by dividing the segment of a circle into pointed elongated forms. These were likewise a lathe

or screw machine product and we have no record that these forms were ever produced commercially or offered for sale to the metal trades generally, but were used in the burnishing processes carried on by his own company.

No further development in burnishing material was recorded until 1923 when the writer first introduced burnishing Pebs to the trade. These were formed by exploding a column of molten steel with steam, the resulting drops being quenched in lime water and then highly polished. Following this, in 1927 after years of careful research work in barrel burnishing he recognized more fully the necessity for a broader line of metallic burnishing forms whereby a manufacturer or barrel operator might have pre-determined assurance of a complete burnishing operation on practically every kind and character of parts and which contained angles and grooves that could not be burnished by the regulation round balls.

Prior to this, various manufacturers continued to send in parts on which only a partial finish could be secured by round balls, and in order to get a satisfactory color from angles, grooves, and so on, where round balls would not burnish, there were times when a buff and polishing abrasives were resorted to in order to complete the work which had been only partially performed by the balls in the burnishing barrel. There was a very distinct difference in the color secured by barrel burnishing and the use of a rapidly revolving buff, and in some cases this also made a difference that was very noticeable after the parts were plated. A round ball offers the least resistance of any known body, but aside from the fact that it cannot effect contact with angles and grooves in barrel burnishing proc-



esses, it is equally true that aside from its sphericity, a sphere cannot be the most satisfactory burnishing medium because in producing a burnished finish in barrels a material form is required which will offer greater rather than less resistance. Aside from their greater efficiency in burnishing into angles and grooves, formed burnishing pieces tend to have an interlocking effect that sets up such resistance to the parts passing through the burnishing mass and which provides not only a more complete over-all finish, but accomplishes this finish in materially less operating time.

The metallic burnishing materials available to barrel operators today are limited to eleven forms each of which may be secured in three principal sizes of ⅛-in., 3/16-in. and ¼-in. except round balls which may be had in the size range by 1/16-in. from 1/16-in. to ½-in. inclusive, the best results however invariably being secured in the size range from ⅛-in. to ¼-in. not only from balls but from the formed pieces as well. 1/16-in. and 3/32-in. balls were used, at least to some extent, prior to the introduction of the various burnishing forms. The objection to these small sizes is not only to their high first cost per pound, but in the difficulty presented in handling them in carrying out the burnishing process.

A brief description of the various burnishing forms is as follows:

Balls—Metallic case hardened with which, of course, every barrel operator is familiar.

Double Cones—Two conical forms joined at their base by a projecting fin.

Steel Discs—Small flat discs generally 1/16-in. in thickness and ¼-in. in diameter. Used for effecting burnishing contact in slots and grooves. Are never used alone, but mixed with some other forms of burnishing materials.

Pins or Oats—This form is available generally in two sizes, 1/16-in. x ½-in. and ⅛-in. x ⅜-in. The latter size is by far the most effective. It is a more sturdy piece having specific gravity more nearly comparable to the other forms composing a burnishing material mass. Never used alone, and generally compose 16 per cent of the burnishing mass.

Balcones—A combination of a cone and one half of a ball bisected by a fin at the equator, and it is from this combination of a ball and cone that it derives its name.

Finbals—A combination of the two halves of a ball bisected at the equator by a projecting fin and deriving its name from this combination. The projecting fin in both Balcones and Finbals is such that they will satisfactorily contact and burnish angles and grooves down to 1/64-in.

Pebs—Burnishing forms in a size range from 1/16-in. to 3/16-in. formed by exploding molten steel into globules somewhat resembling metallic rain drops or small pebbles, deriving their name from a shortening of this word. Technically they would be described as hetermorphic assymetrical polished metallic units each of which are substantially pebble shaped.

Diamonstels — Diamond shaped lozenges of steel having two rounded edges and two square sheared edges. A most efficient piece for burnishing stampings which contain holes from which burrs are required to be burnished smooth.

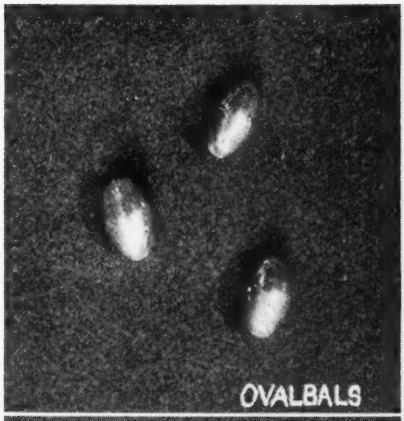
Ovalbals—Oval shaped or elliptical steel forms tapering from the centre toward either end. Far more effective than round balls, for they provide a greater break-up in the burnishing mass when in motion.

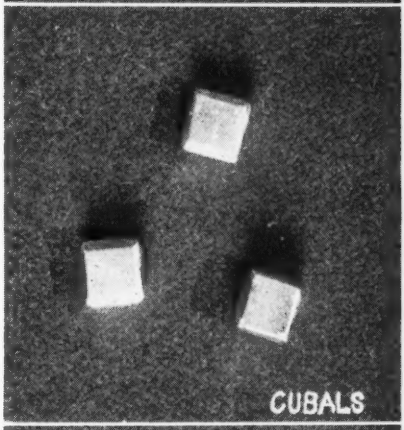
Cubals—Square cut burnishing

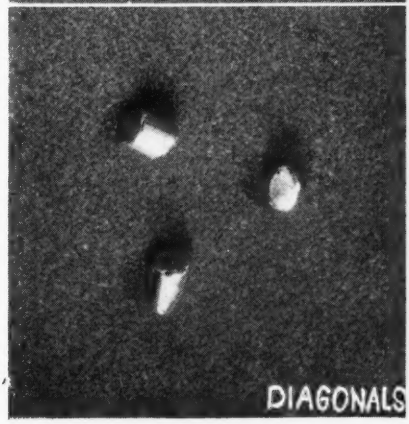
steel forms with slightly rounded edges and rounded corners, resembling a highly polished steel dice in form. They derive their name from the word cube but are used in the same sense for burnishing as a ball.

Diagonals—One of the most effective steel burnishing pieces ever developed. They are round steel sections diagonally cut from the rod and are from the long to the short side, the same diameter as their round section. In burnishing they present a line contact with the parts being burnished as distinguished to the point contact had from round balls. They are most effective for burnishing into angles and grooves and may be used alone or mixed with other burnishing forms.

Let us suppose that to an artificer doing hand burnishing work we give only one form of stylus, and that a ball pointed one. It would be readily seen that much of the fine work, the following out of delicate traceries, the burnishing of angles and grooves, with the use of only one tool, would simply be impossible of accomplishment and yet, it is expected by many that round balls should reach into and burnish angles, a thing mechanically impossible. Remember we are seeking to accomplish by burnishing in revolving barrels large masses of parts as distinguished from the individual handling of each separate part when burnished with various forms and sizes of hand burnishing stylus. Most certainly we cannot expect the barrel process, a totally inanimate one, to equal the work of an artisan, nor can we expect even an approximation of the artisans work if we do not include in the burnishing mass such forms of burnishing materials as will reach into and effect burnishing contact under pressure with every part of the product to be burnished.







In general, the formed pieces are more costly than round balls but only in the first instance of their purchase price. In operation, they are so much more satisfactory that they very quickly absorb the slightly higher first cost by the speedier and more efficient manner in which they enable an operator to complete the over-all burnishing operation. In all burnishing materials, the smaller size ranges are always the more efficient; the ⅛-in. pieces will effect eight contacts per inch, the 3/16-in. five, and the ¼-in. four. Irrespective of size the balls and formed burnishing pieces will bulk exactly the same, namely, one hundred pounds to the peck. They practically all have the same specific gravity of 4.9. (The relation of specific gravity in the barrel burnishing operation will be described in a later paper.)

Burnishing materials should never be selected on the basis of the larger sizes at a lower price per pound. In a majority of cases where this is done the buyer finds eventually that his burnishing costs are far more than had he purchased the forms and sizes applicable to his work irrespective of the higher cost per pound. The rise in price from ¼-in. materials downward to ⅛-in. materials is not large, and wherever the application requires we most emphatically recommend the smaller size range rather than the large.

It is not the purpose of this series of papers to be argumentative in any sense but there is seemingly a conflict at all times on the question of the efficiency of the conventional round ball versus formed burnishing pieces. Following, we give a sidelight on the subject that we feel will be of interest to barrel users in general.

We have in this country, embraced in the ball bearing manufacturing industry, a group of companies, which, taken together, are admittedly the largest users of steel balls in the whole world. They, if anyone, should be able to best judge of the efficiency, and practicability of the use of round balls in any application, and yet, in their barrel burnishing work, not a single one of them use round balls, but all of them do use various styles and sizes of formed burnishing; pieces. These companies and the form they use are as follows:

SKF

Hess-Bright
Balcones, Finbals, Diagonals, Pebs.

Norma Hoffman
Bearings Corporation
Diamonstels, Diagonals, ⅛x⅜ Pins.

Fafnir Bearing Co.
Diagonals.

Gurney Ball Bearing Co.

Storm Ball Bearing Co.
Divisions of the
Marlin-Rockwell Corp.
Diagonals.

Bearings Company of America.
Balcones, Diagonals, Diamonstels.

Nice Ball Bearing Co.
Diagonals.

No doubt, whether further comment should be necessary, but seemingly in barrel design as well as in metallic burnishing materials there is a "bogging down" of progress by an insistence on the use of balls as the sole medium for carrying out the process perhaps simply because they happened to be the first permanent burnishing material used. Now balls, of course, will provide a very satisfactory burnished finish on flat areas but when compared with formed burnishing pieces, they can, in no sense, be considered the most satisfactory medium for the carrying out of the process.

While really a processing problem,

we should here mention the tendency of so many barrel operators to purchase hardened steel burnishing materials for removing burrs from stamping. This work is far more satisfactorily done when burnishing materials that have been annealed "dead soft" are used. Hardened materials have a tendency to pein over the burrs of stampings, but soft annealed materials will bite onto the burrs and remove them in a far more efficient and satisfactory manner.

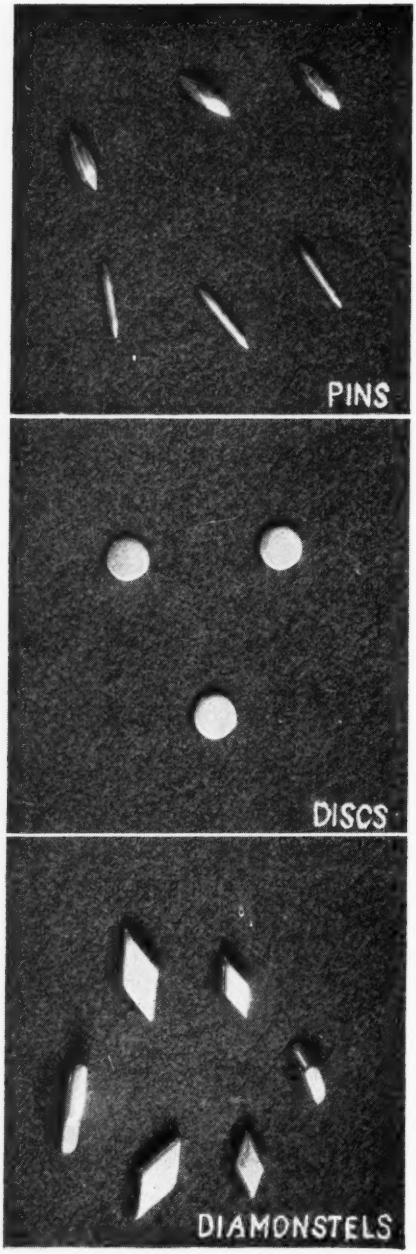
Finally, we would suggest to the prospective purchaser of metallic burnishing materials that he request various manufacturers to submit representative samples of the various sizes and forms of burnishing materials they manufacture. When the samples are received, assemble a sample of each of the parts to be barrel burnished, noting any angles, grooves, and so on, on the parts that require over-all finish. Now select from the samples of burnishing materials the sizes and shapes of materials that will effect contact into and over every part, for this is the only manner in which one may have predetermined assurance of a complete over-all burnishing action. Sometimes one form may suffice and again it may require three or four and perhaps five separate forms and sizes. After the various forms and sizes are determined, it is a very simple matter to place your order, for you simply divide the quantity of material you wish to purchase by the number of forms and sizes selected and then order equal parts of each.

The quality of the surface finish of the burnishing materials and the method of heat treating are most important factors in the quality of the burnished finish secured. Some burnishing materials show a coarse structure while others will have a fine sating grain to the depth of the hardened case. All burnishing materials are of the case hardened variety—there is no necessity for hardening clear through, but the depth of the case hardening should be at least one-third. The quality of the surface finish is important and burnishing materials should be velvety smooth.

At some time down through the years someone now unknown conceived the idea that all metallic burnishing materials must have what would be technically known as a "Glass Hard" finish. This is not necessary, for many formed pieces would be damaged in work if this rule were followed, and hence a slight normalizing following the heat treatment provides the best burnishing material.

Most burnishing materials are lime finished, but the more efficient and quite naturally the more expensive have a subsequent crocus finish. Low priced burnishing materials may seem perfectly smooth and fine grained to the naked eye, but when examined under a glass, invariably show a coarse porous structure. This surface porosity rapidly fills with dirt and gives the material a dull and lifeless appearance, and naturally retards the burnishing operations. Too soft, or improperly hardened material will have a dead semi-dull surface sheen as will also too coarse structure, and the best burnishing material having a fine satin grain will invariably, due to its final crocus finish, have a highly lustrous or limpid surface finish and produce by far the finest burnishing results.

This dull and lifeless appearance to which we above refer should by no means be confused with another kind of dull and lifeless appearance of burnishing material which is caused by carelessness of the barrel operator in permitting his burnishing material to become dirty. There is a



distinct difference between dull material caused by faulty heat treatment and that caused by dirt. While this question of dirt will be emphasized in a later paper let us here state that scrupulous cleanliness both as to the inner surface of the barrel, the burnishing material and the parts to be burnished as well, is the price that every barrel operator must expect to pay in order to secure the most satisfactory barrel burnishing results.

Manufacturers of steel bearing balls are continually besieged by those who desire to purchase rejected bearing balls for barrel burnishing applications. It can never be said that such balls are as satisfactory a material as regular burnishing materials developed and manufactured especially for barrel burnishing work. The principal reasons for rejection of steel bearing balls are pitted surface, part soft areas, digs, cuts and scratches and balls that crack in the heat treating process. For the most part, balls for ball bearings are made from high carbon alloy steels and must be hardened clear through. If the internal strains are not completely relieved, fire or water cracked balls result in the heat treatment. No one, of course, knows when these cracked balls will break apart, but when they do each part presents edges as sharp as any cutting tool since they are intensely hard. It is almost unbelievable how much damage even a very small proportion of such broken balls will cause when included with a barrel burnishing mass and especially where the parts to be burnished are non-ferrous in character, and this even if we do not consider the damage caused by the sharp edges of pits and digs on the surface of rejected balls. Inasmuch as all specially made burnishing materials are carburized and the depth of hardening does not penetrate entirely through the piece, the problem

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of internal strains is largely eliminated and either fire or water cracks are never found. We cannot recommend rejected bearing balls for barrel burnishing work except in one preliminary operation of cutting down or removing scale prior to barrel burnishing where they are used as a weight adding medium in the mass and also to cushion the parts one from another as they give pressure to the abrasive medium.

It is well for all of us to remember that the metallic burnishing materials we use are really the "jewels" of our barrel finishing work, and it will be generally found to be poor economy to purchase materials on the basis of price rather than of quality, for there is no step in the metal finishing process where quality pays so large a return in long life and satisfactory performance than in the purchase and use of the very highest grade of metallic burnishing materials, and this is true even if the manufacturer himself considers the parts to be barrel burnished only commonplace.

Hartzell Parallel Step Anodes. A 4-page folder describing and illustrating the Hartzell Parallel Step Anodes for chrome plating has been prepared by the Hartzell Mfg. Co., Inc., 319 Grand Ave., Dayton, Ohio. Radically different, but sound in design and principle, this anode is said to put more current into the solution than has heretofore been possible and thus distributes the current so that highest quality work is done. Missing out is practically eliminated. Current can be reduced to as little as ½ to 1 volt and still put a maximum amount of current into the solution. The Hartzell Parallel Step Anodes are furnished in any length from 18 to 48 inches. Standard hooks accommodate anode rods up to 1½ in. diameter and 5 to 6 in. from the solution to the top of the anode rod. The anodes are provided with copper cores which are insulated with a lead sheath above and below solution level, thus preventing excessive surface currents. Consequently there is no burning off at the solution line. Copy of folder free upon request.

P & H Hoists, Bulletin No. H-5. The Harnischfeger Corporation, 4535 W. National Ave., Milwaukee, Wis., has just issued a bulletin entitled "P & H Hoists". The bulletin is profusely illustrated with more than 25 industrial application photographs, which describe the added advantage in handling "off-the-floor". It contains the treatment of both general and specific problems in the industrial handling field as well as many diagrams which explain simplified construction and operation in modern hoist design. The bulletin lists the ratings and operating ranges for hoists from the 100-lb. capacity to the 15-ton capacity, as well as specifications and electrical accessories. Copy free upon request.

Explosion Tested D.C. Motors. Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., is now issuing Leaflet No. 20652 describing and illustrating the Westinghouse Explosion-Tested Fan-Cooled Totally-Enclosed Type SK Direct Current Motors. The Type SK Motor is designed for use in locations where explosive gases or dust may exist. The motor is designed to give the maximum of service and operate with a minimum of maintenance. It is built in sizes from 5 to 75 h.p. and to operate on 115, 230 and 550 volts.

A feature of the motor is accessibility, which is obtained by the use of a double walled bracket on the commutator end. The bracket is equipped with hand hole covers which are readily removable to permit inspection and adjustment of the brushes and commutator. The fan is on the commutator and provides efficient ventilation because the flow of cooling air is not restricted by pulleys, gears, gear cases, and so on. In addition to these features, the motor is built into a rolled steel frame, has vacuum impregnated field coils and mica insulation on the armature coils.

The Type SK motor is designed, built and tested to stand an internal explosion of gas (methane) or coal dust without injury to the equipment or without emitting flames or sparks which would ignite surrounding gas. The fan on the commutator end forces a large volume of cooling air through properly located air passages makes possible high continuous capacity with minimum size. To guard against the covers being removed by unauthorized persons, each cover is provided with a hole in the web for insertion of either a wire meter seal or chain and lock. Copy of the leaflet is available upon request.

BUT WHAT GOOD IS "MODERN DESIGN" IF THE PRODUCT CORRODES?

Mechanically the product may be as nearly perfect as modern engineering can make it, but if rust impedes its efficient operation or disfigures its fine appearance, it is not completely up-to-date.

The iron or steel product that gives the greatest satisfaction is Parker rust-proofed. Hundreds of items from tiny typewriter screws to huge transformer radiators are given the benefit of Parker rust-proofing processes . . . the most widely used chemical rust-proofing processes in the world. Whether it be a heavy machine part or a beautifully finished automobile or refrigerator, there is a Parker rust-proofing process especially adapted to the need. Parker processes may be used on galvanized, galvanealled and zinc alloy surfaces . . . as well as on iron and steel.

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PARKER *Processes* **CONQUER RUST**
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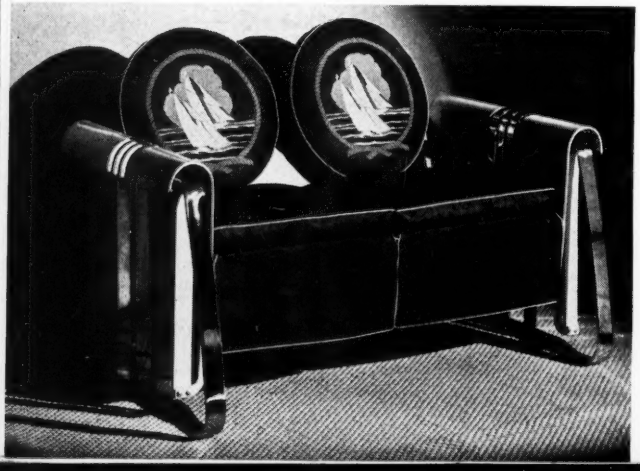
FINISHES THAT AID IN APPEARANCE AND UTILITY

Right—Interesting is the use of aluminum by the Gauchos of Argentine, who purchased some cast aluminum stirrups a few years ago. These stirrups were sandblasted and highlighted and then were protected by a coating applied by the Alumnite process. The stirrups have been colored a light brown and the highlights have been left in the metal's natural color.

(Photo courtesy Aluminum Company of America)

(Photo courtesy The McKay Company)

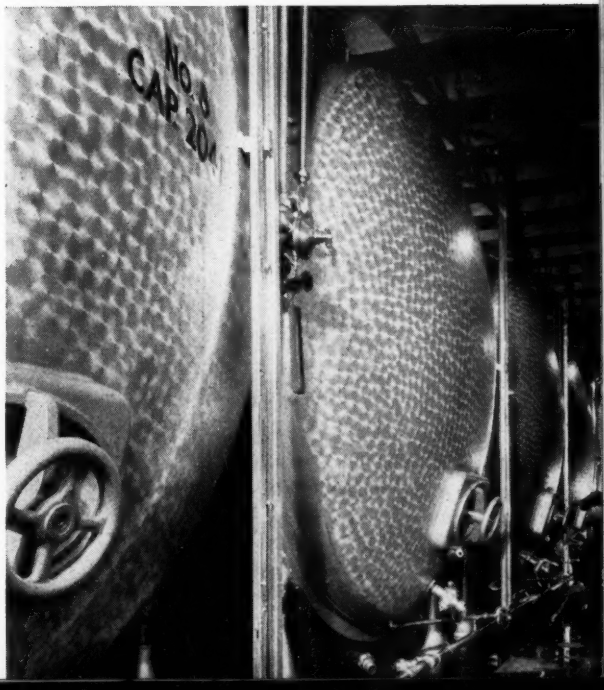


Left—A combination finish consisting of chromium and baked enamel provides beauty as well as durability for the two-passenger glider shown herewith.

(Photo courtesy The Hobart Manufacturing Company)

Left—The chromium plated die cast trimming on this newly-designed coffee-mill has been buffed to a satin finish. Supporting the trim is a polished black bakelite housing.

(Photo courtesy Aluminum Company of America)



Right—When an interprising brewing company of Jeannette, Pennsylvania, decided to dress up its government storage tank room, it applied a swirl finish to the heads of the eight 204 barrel storage tanks shown in the illustration.

NEWS *of the* INDUSTRY

Charles F. Rohleder Appointed Chief Chemist of Maas & Waldstein

Charles F. Rohleder has been recently appointed Chief Chemist of Maas & Waldstein, Newark, N. J. Mr. Rohleder was graduated from Cooper Union, New York City, in 1926, with the degree of B.S. in Chemistry and has spent all of his professional life in the industrial

Charles F. Rohleder

finishing field. His experience includes research, production control, and supervision of production.

Magnus Chemical Company, Inc., Appoints David Blanchard Vice-President in Charge of Sales

Magnus Chemical Company, Inc., 10 South Ave., Garwood, N. J., manufacturers of cleaning materials, industrial soaps, sulfonated oils, emulsifying agents and metal working lubricants, has announced the appointment of Mr. David Blanchard as vice-president in charge of sales.

Mr. Blanchard has been vice-president of the company for the past fourteen years in charge of the Portland, Maine, office. As one of the pioneers of the Magnus Chemical Company, Inc., at its inception in 1921, Mr. Blanchard has literally grown up in the industrial cleaning field. He will have supervision of the Magnus Sales Organization and direct the merchandising of many new products being marketed by the company at this time.

Annual Convention of the American Electro-Platers' Society

The annual convention of the American Electro-Platers' Society is to be held this year in New York City on June 14, 15, 16 and 17. The Hotel Pennsylvania, opposite the Pennsylvania Railroad Station, in the very heart of Manhattan, has been selected as the place of the meeting. This hotel is ideally located and provides spacious, luxurious, comfortable, and yet surprisingly reasonable living quarters. The plan of the convention is to make the stay in New York City a joyous, profitable, stimulating, and long-remembered happy episode.

An educational program has been planned to supply a long-felt want; one entire day is to be devoted to the reading of practical papers, submitted by plating room foremen. The convention committee seeks the cooperation of the members of the American Electro-Platers' Society and those interested in the success of the convention. The heads of the following committees will welcome constructive suggestions: as General Chairman and Treasurer, Franklyn J. MacStoker, 25 Princeton St., Garden City, N. Y.; as Secretary, Henry A. Painter, Berkley Blvd., Iselin, N. J.; on publicity, Louis H. Cates, c/o Enequist Chemical Co., Inc., 255 Freeman St., Brooklyn, N. Y.; on general program, Ralph J. Ligouri, 2429 Hubbard St., Brooklyn, N. Y.; on educational, John Rolff, 117-30 168th St., Jamaica, N. Y.; on entertainment and banquet, Benja-

min Popper, c/o Egyptian Lacquer Co., Rockefeller Center, New York, N. Y.; on registration, Henry A. Painter, Berkley Blvd., Iselin, N. J.; on hotels and reservations, Aaron Englander, 729 Lafayette Ave., Brooklyn, N. Y.; on transportation, Henry Levine, 371 Fort Washington Ave., New York, N. Y.

Plans have been formulated to hold an outstanding exhibit of plated ware which is to be submitted by manufacturers and members of the various branches of this society.

New York Belting & Packing Company Announces New Distributors

B. F. Ruether, general manager of the New York Belting & Packing Company, Passaic, N. J., has announced the appointment of Crerar, Adams & Company, 3550 S. Morgan St., Chicago, Ill., as distributors of the complete line of New York Belting & Packing Company mechanical rubber goods in the Chicago territory. Through the facilities of Crerar, Adams & Company, the users of N. Y. B. & P. high grade mechanical rubber goods are assured complete stocks and efficient service.

The Charles B. Scott Company, 119 Franklin Ave., Scranton, Pa., has also been announced as distributors for the New York Belting & Packing Company.

The Wright Manufacturing Division of A. C. & C. Company Appoints Sales Manager

The Wright Manufacturing Division of American Chain & Cable Company, Inc., Bridgeport, Conn., manufacturers of hand-operated chain hoists, trolleys and cranes, and electric hoists, has announced the appointment of Charles B. Veit sales manager with headquarters at York, Pa., and S. J. Woodworth with headquarters at the New York Central Bldg., 230 Park Ave., New York, N. Y. Both Charles B. Veit and S. J. Woodworth have been associated with Wright Manufacturing Division for a number of years.

G. A. Ruehmling Joins Schrumn Process Company as General Manager

The Schrumn Process Company, Providence, R. I., builders of controlled atmosphere furnaces for bright annealing, brazing, and special metal-treating processes, has announced the appointment of G. A. Ruehmling as general manager. Mr. Ruehmling brings to Schrumn Process Company a wide and varied experience in the fabrication and application of ferrous and non-ferrous metal in solid and clad formulas.

In his new position he will supervise the manufacture and sale of the company's equipment. Mr. Ruehmling holds degrees from both Columbia and Northeastern University.

Mr. E. Blount to Conduct Evening Course in Practical Electro-Plating at Ohio Mechanics Institute

A lecture and discussion course in practical electro-plating is now being offered at the Ohio Mechanics Institute, Cincinnati, Ohio, to be conducted for a period of sixteen weeks, under the direction of Mr. Ezra Blount. It is intended primarily for those who are engaged in electro-plating, and for those who know something about electro-plating and desire to know more of the technical processes. The increasing use of plating, particularly with chromium, has made it necessary for those engaged in the work to enlarge their scientific knowledge of the principles involved.

The class work will include a discussion of electro-plating terms, cleaners, pickling acids, copper plating solutions, cold nickel plating solutions, hot nickel plating solutions, chromium plating solutions, tin plating solutions, cadmium plating solutions, zinc plating solutions, alloy plating, practical use of brightening agents, and plating processes. There will be discussions on the mechanism of the corrosions, corrosion tests, reworking of rejected material, and methods of stripping.

McCreary to Handle Allen-Bradley Line in Kansas City

The Allen-Bradley Company is now being represented in the Kansas City territory by B. L. McCreary, with offices in the Mutual Building, 405 E. 13th St. J. W. Briddick, former Kansas City sales agent for Allen-Bradley, has left the city to establish himself in business in Toronto. Mr. McCreary has been established in Kansas City for a long time as a representative of the Frank Adams Electric Company, and he will now also handle the Allen-Bradley line. Mr. McCreary will carry an ample stock of Allen-Bradley control equipment so as

to be able to take care of the needs of the territory.

Ajax Flexible Coupling Company Announces New Pittsburgh Location

Ajax Flexible Coupling Company, Westfield, New York, has announced a new sales office in Pittsburgh, Pa., located at 970-B Union Trust Building. Mr. J. Guy Griffith is to be in charge of this office.

Porcelain Enamel Institute Forum

The plans for the first annual Porcelain Enamel Institute Forum are rapidly nearing completion. As previously announced, the Forum will be held on May 5, 6 and 7 at the University of Illinois, and will be open to everyone in the porcelain enamel and related industries.

Prominent among the speakers at the Forum, in addition to the regular technical program, will be Robert G. Calton of the Tennessee Enamel Manufacturing Company, president of the Institute, and the two Institute vice-presidents—F. E. Hodek, Jr. of the General Porcelain Enameling & Manufacturing Company, and E. L. Lasier of the Titanium Alloy Manufacturing Company.

According to advance information, Mr. Hodek will make preliminary announcements regarding the 1938 Forum which is to be held at Ohio State University. Mr. Lasier will point out what has been done by the Institute's Educational Bureau for the man in the shop. A meeting of the Forum Committee was held during the American Ceramic Society Convention in New York City the week of March 21, at which time final details for the Forum were arranged.

Black & Decker Announces Appointments

The Black & Decker Mfg. Co., Towson, Md., announces the appointment of John M. Schreiner as manager of their Detroit branch to succeed the late George W. Stoiber. John Schreiner has been active in the Detroit area for the past twelve years and is well equipped to look after the interests of the trade in this territory.

W. J. Fenwick, who for the past several years has been co-manager of the Cleveland territory, has been appointed manager of all activities in that branch.

G. H. Treslar has been appointed supervisor of the Detroit and Cleveland territories and will cooperate with Messrs. Schreiner and Fenwick in the promotion of sales in these areas. The above changes are in line with the broad policy of the Black & Decker Mfg. Co. to give increasingly close cooperation to distributors in the field and at the same time recognize meritorious work and length of service with the Black & Decker organization.

MSA Announces Formation of New Company

The Mine Safety Appliances Company, Pittsburgh, Pa., has announced the formation of The Mine Safety Appliances Company of Canada, Ltd., a company which will take over the personnel and business of the safety department of Drummond, McCall & Company, Ltd., Montreal, Quebec. The Drummond, McCall & Company, Ltd. were agents for The Mine Safety Appliances Company since 1918.

The new company which is located at 802 Railway Exchange Bldg., 637 Craig St., West, Montreal, P. Q., is in charge of R. Morris, former manager of the safety division of the Drummond, McCall & Company, Ltd. R. M. McCall will represent the new company in Nova Scotia with an office and warehouse at New Glasgow.

Among the products of The Mine Safety Appliances Company are the McCaa oxygen breathing apparatus, and Comfo respirators.

Pangborn Corporation Announces Expansion Program

Pangborn Corporation, Hagerstown, Md., manufacturers of blast cleaning and dust collecting equipment, announce the beginning of extensive additions to their plant. This building expansion program is in line with the activity of the company and involves an expenditure for building construction and new equipment of approximately eighty thousand dollars.

McAleer New Location

The McAleer Manufacturing Company, 2431 Scotten Ave., Detroit, Mich., manufacturers of lacquer rubbing compounds, buffing compositions, and other metal finishing products, recently announced their removal to their new location illustrated herewith. This big, modern plant will provide manufacturing equipment of the most advanced design for enabling McAleer to furnish a product of greater uniformity than ever before.

Laboratories, which are perhaps the most complete in the industry are at

The McAleer Manfg. Company is now occupying this modern building.

the disposal of the McAleer engineers for research and development work in finished products and careful checking of incoming raw materials. The laboratories, as well as the service of the trained sales engineers, are also at the clients' disposal.

Synthane Corporation Appoints Detroit Representative

The Synthane Corporation, Oaks, Pa., manufacturers of laminated bakelite, has announced the appointment of Mr. William H. Borden as their Detroit representative. Mr. Borden's office in Detroit is located at 7310 Woodward Ave. Until his appointment, Mr. Borden represented the company in Pittsburgh, Pa.

Roxalin Trail Blazer—A Traveling Display

On Monday, March 8th, a group of business paper editors attended a meeting at the plant of Roxalin Flexible Lacquer Company in Elizabeth, N. J., where they were treated to a tour of the plant and laboratories and a preview of the Roxalin Trail Blazer — a graphic and mobile demonstration of what lacquer and synthetic finishes can do to protect and beautify manufactured products.

The Trail Blazer itself is a trailer, 22 feet long, elegantly equipped and finished in two shades of blue and aluminum. The Roxalin flexible finishes used were applied at the plant. Several people can be comfortably seated to talk business over a table and there is ample room for visitors to circulate freely viewing the exhibits which are placed in corklined wall panels and show cases. The displays presented more than 200 parts and assembled products actually in commercial production, which have been finished with Roxalin flexible lacquer and synthetic coatings, in every conceivable style, design, color and shade, to stand every type of use and abuse, chemical and physical.

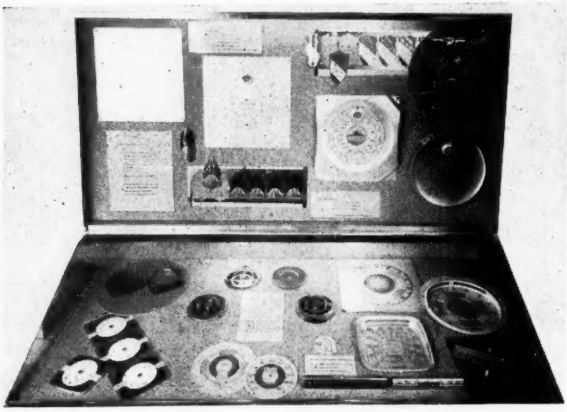
The basic materials upon which finishes were shown included metals, wood, rubber, textiles, leather and paper. Two finishing problems were infinitely varied: resistance to human perspiration; resistance to weathering; resistance to chemicals—acids and alkalies; resistance to abrasion, blanking and forming.

Every exhibit in the Roxalin Trail Blazer has a story to tell. The "Port Hole" test shows a piece of metal foil, clear-coated with Roxyn C (an air drying or baking synthetic), spotted by nitric acid on the uncoated side. The acid has eaten through the metal to the transparent film and has stopped right there. Steel tubes finished with one coat of Roxyn C withstand hard banging together without chipping, flaking or peeling. On discs finished with Blue Knight flexible finishes, the various stakes of blanking and forming, after lacquering are shown. An exhibit of name plates, dials, and so on is shown to demonstrate the production advantages of finishing materials that are highly flexible and adherent.

Another interesting exhibit of the properties of the same material is the Brittling Test conducted by an electrical manufacturer. An aluminum fan blade, coated with this finish, was subjected to 212 deg. F. in a steam oven for two years with no loss of flexibility or adhesion.

One of the most striking exhibits consists of finished rolls of metal edging for boxes. The edging is made of strip steel, first coated with Blue Knight flexible finishes in all colors; then slit and perforated; then reeled. These reels are

sent out to shipping rooms all over the United States where paper box flats, lithographed and printed (some with grease-proof coatings by Roxalin), are assembled on automatic machines, which form the angle and sink the projections into the boxboard. All of these vigorous operations are successfully performed without chipping, flaking or peeling of the flexible finish.



One of the many displays on exhibit in the Trail Blazer

Samples of work done by the General Etching and Manufacturing Company illustrate the application of Ba-Flex before the plating operation as it withstands all plating solutions including chromium, and is buffable without "drag".

Fashions in Finishing

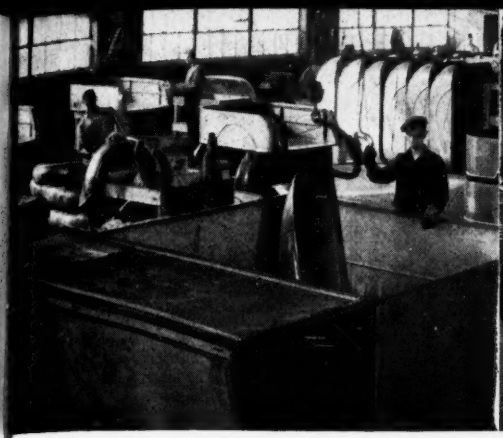
Rincon-trol, a texture synthetic, is portrayed as an easily controlled wrinkle finish without "fatty" edges, with fine grained texture (small craters) and great resistance to perspiration. The Carrier Corporation uses this finish on its air conditioning units as large as 3 ft. 6 in. by 5 ft. 6 in. by 3 ft. 3 in. A new style note in texture finishes is the combination Roxyn and Rincontrol, two-coat, one-bake system.

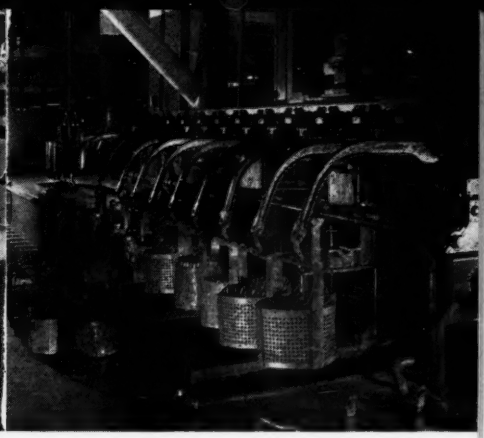
This combination is shown on zinc and aluminum die-castings to demonstrate the new fashions in finishing, resulting from interesting stencil applications and two-tone work done with only one bake.

The applications of flexible finishes to non-metals are just as interesting. For example, the wooden Venetian blinds at the Trail Blazer windows provide a demonstration of four different finishing schedules—very handsome jobs. Textiles are printed with Blue Knight finishes without stiffness. Rubber and textile-covered cable, finished to meet Army and Navy Specifications, show resistance to high heat, moisture and hot oil and possess high di-electric strength. This miscellaneous non-metals exhibit is topped off by molded rubber statuettes, and for trimmed and plain goloshes coated with stretchable lacquers.

The Roxalin Trail Blazer presents its story visually and graphically to manufacturers throughout the United States, demonstrating how many applications lacquers have and how lacquers can brighten merchandise, no matter how dull or prosaic the base may be, making it saleable; how lacquer will protect and preserve the product—in the ultimate consumers' hands; how lacquer will sell an article and make it stay sold.

Roxalin Trail Blazer — A Traveling Display





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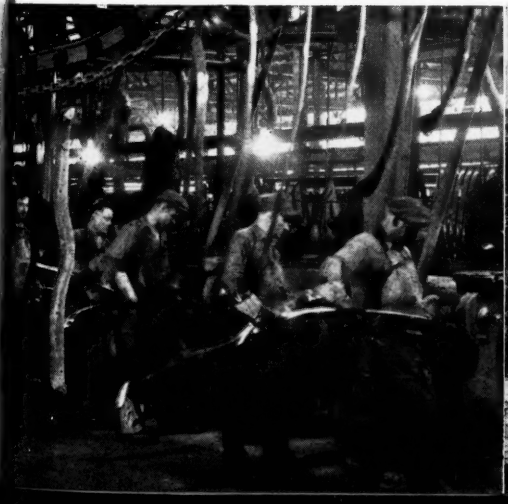
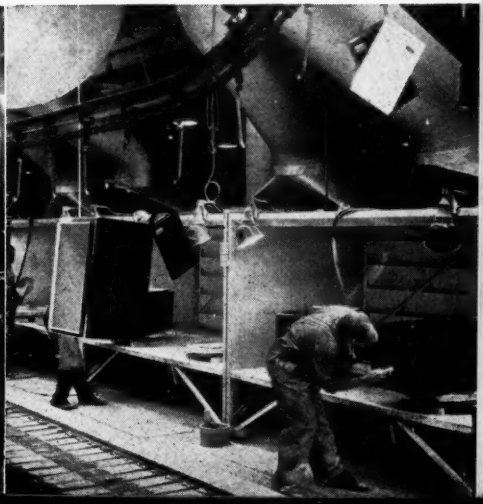
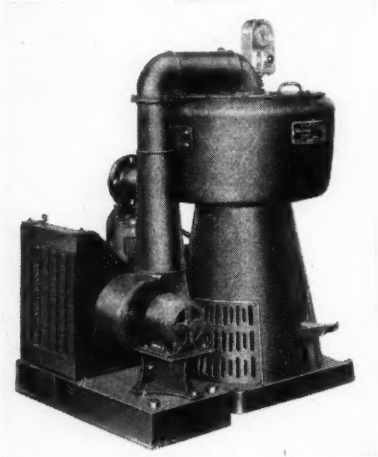




New Plant Equipment and Materials

Tolhurst Centrifugal Metal Dryer

The Tolhurst Centrifugal Division, American Machine and Metals, Inc., 100 Sixth Ave., New York, N. Y., has brought out the Tolhurst Centrifugal Metal Dryer illustrated herewith. This type of machine can be used throughout the metal industry to handle the drying of small metal parts, such as cabinet hardware, automobile parts, fasteners, and stampings. The Tolhurst process is said to eliminate sawdust tumbling. The pieces to be dried are placed into a removable perforated basket, which is placed in the machine and rotated at high speed, at the same time blasts of heated air are forced through and around the parts.



Tolhurst Centrifugal Metal Dryer

The centrifugal force developed throws off the moisture, and the hot air quickly completes the drying. The entire operation consumes from two to three minutes. The rapid drying prevents any spotting or tarnishing of the parts.

Improvements on this new unit include a more compact drive through "V" belts by a vertical motor attached to the casing. An efficient electric heater combined with a powerful blower is now used to supply the heated air. Timer control operation is said to save lost time.

Quaker Dri-Sil

For the degreasing of metals in tanks and in washing machines, with or without electric current, the Quaker Chemical Products Corp., Conshohocken, Pa., has placed on the market a new product, to be known as "Quaker Dri-Sil". This compound is said to be a complex silicate containing less than 3 per cent of moisture. It is completely soluble in hot water. Dri-Sil is a pure sodium silicate with an exceptionally high Na_2O content. It is not a mechanical mixture but a true chemical compound.

In some instances it is advisable to use soap in an alkali tank. This is particularly true in the case of the so-called soap solution, in which anywhere from 5 per cent to 15 per cent of anhydrous soap can be added to the Dri-Sil. Sodium resinate is a readily soluble soap recommended for this purpose. While soap is not ordinarily recommended for electric cleaning, in some cases it is satisfactory to use approximately 1 per cent sodium resinate based on the weight of the Dri-Sil in the electric cleaning bath, since this aids in the wetting out of the metal.

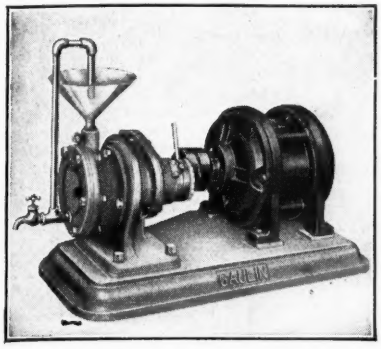
Since Dri-Sil is a true chemical compound, the Na_2O released is in direct proportion to the silicate.

Gaulin Laboratory Colloid Mill

A colloid mill which is said to develop a peripheral rotor speed of from 9000 to 10,000 ft. per minute has been placed on the market by the Laboratory Equipment Co., 146 Lafayette St., New York, N. Y. The periphery of the rotor of the Gaulin mill travels approximately 10,000 ft. per minute. In order to produce this, the rotor revolves at about 20,000 r.p.m. This speed is created by a gear train, running in oil and is constant regardless of fluctuations in load, viscosity and so on.

The treating gap of the Gaulin mill

is adjusted by means of an external adjusting dial which is calibrated in thousandths of an inch. All adjustments



Gaulin Laboratory Colloid Mill

may be made while the mill is in operation.

Water cooling prevents overheating and decomposition. This is said to be an outstanding development in colloid mill construction. Hot water may be used in the jacket of this mill where emulsions of materials having high melting temperatures are made.

An air release on the grinding chamber makes it possible to fill the latter with the material to be emulsified and force out all air before starting. As no air is present, no foaming will occur. Oxidation, fluffiness and all unstable emulsions are eliminated.

By a novel arrangement of the adjustable grinding gap on the back rotor face, a marked improvement is said to be made. Heretofore, whenever shaft expansion occurred, due to heat, and the adjustment of the grinding gap was at all fine, the increase in shaft length would drive the rotor against the stator. On the Gaulin mill the shaft expansion actually opens the gap and causes the motor to run more freely.

The Gaulin mill is used for making emulsions and dispersions of small particle size and extreme stability; for making fine lubricants, polishes, latex dispersions, grinding and dispersing pigments, colors, asphalt and resins; for colloidal fuels and countless other colloidal products.

The milling chamber, rotor and stator faces, and all the parts in contact with material to be treated are made of stainless steel and bronze. The overall dimensions of the Laboratory Colloid Mill are 20x18x10 in.; the weight is 91 lbs. A ½ h.p., single phase A.C. 3600 r.p.m. motor is provided as standard equipment.

Maehler Standard Size Laboratory Ovens

For the test baking of paint and japan finishes, rubber and synthetics, The Paul Maehler Co., 2216 W. Lake St., Chicago, Ill., has placed on the market a standard type laboratory oven. The oven is constructed in five standard sizes, gas or electric heated, with forced air circulation, for baking or drying operations at 500 deg. F. The Maehler laboratory type oven enables the manufacturer of finishes to determine correct time and temperature baking conditions for various finishes.

Experimentation and tests are easily and economically carried out in the Maehler laboratory oven without costly interruption of production schedules. This type of oven is constructed on the same principles as the Maehler production ovens. Heated air is distributed by means of a fan which results in even heat distribution throughout the oven within a range of 5 deg. F. Hot spots or cold spots which would spoil the

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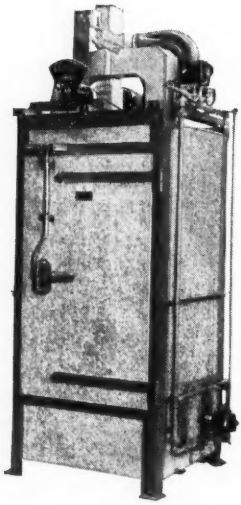
bake are said to be completely eliminated by this unique heat distribution system. In addition, it is said to insure perfect baking or drying, and easy duplication of specific conditions when desirable. A thermostatic control maintains temperature at any pre-determined setting. Ample insulation reduces radiation loss. Gas burners are of atmospheric type and can be used for manufactured, natural, butane, or mixtures of these gases. If desired, electric heating can be used with forced circulation. Standard specifications include burners, fan, Maehler safety latch, temperature control valve, and a safety solenoid valve.



Maehler Standard Size Laboratory Oven

NEW SPRAY GUN

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Cres-Lite Aluminum Paints

The Crescent Bronze Powder Co., 120 W. Illinois St., Chicago, Ill., has placed on the market an aluminum paint to be known as "Cres-Lite" for use on oil tanks, bridges, pipes, fences, freight cars, poles, smoke stacks, power transmission towers, factories, and so on. Cres-Lite may be applied with brush or spray gun. If used on metal, the metal surface is protected and preserved from weather, rust, moisture, heat, fumes, stains, smoke, steam, and the destructive action of the sun's rays.

Crescent Aluminum Paste or Powder is used as the pigment content in all Crescent aluminum paints. The paste is said to be a more modern material, in that it produces a smooth, more lustrous paint than does a powder. It makes no dust and is more economical to handle because it is compact. Crescent Aluminum Paste can be mixed with either varnish or lacquer. Unless otherwise specified, all Cres-Lite aluminum paints contain two pounds of paste per gallon, thus good coverage on all surfaces is assured.

Several of the more interesting features of Cres-Light aluminum paint are: it can be washed; it reflects between 60 and 70 per cent of the total light falling upon it; it completely covers in one coat, and it will hide any under-color because its pigment is made of metallic aluminum which is opaque to light.

Delta 6-In. Belt Surfacer

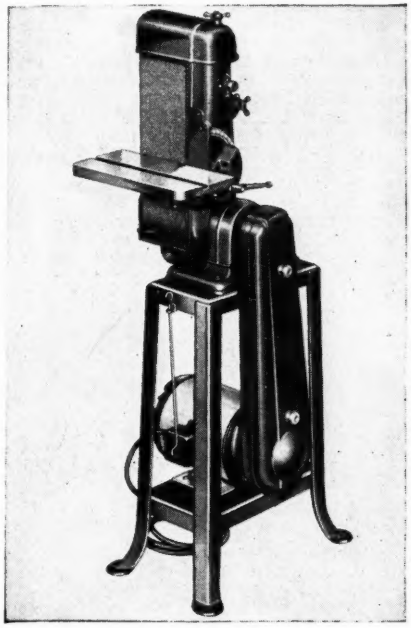
Designed to handle a wide range of sanding, surfacing and finishing operations, a new 6-in. belt surfacer recently marketed by the Delta Manufacturing Company, 600 E. Vienna Ave., Milwaukee, Wis., has several unique features.

It can be used as either a horizontal or vertical sanding machine for surfacing or shaping wood parts. When in the horizontal position it may be fitted with a wood fence and an adjustable back stop to guide and stop the work. In the vertical position it may be fitted with a tilting table that permits a wide variety of angular shaping and sanding.

Its versatility enables it to be used not only in the finishing of metal parts with aluminous-oxide and silicon-carbide belts, but also in the surfacing and finishing of parts made of Bakelite, Catalin and other plastics, bone, tile, asbestos and many other materials.

The machine is completely equipped with self-sealed ball bearings, lubricated at the factory for their entire life. The drums carrying the sanding and finish-

ing belts are designed to eliminate the necessity of rubber coverings which require frequent replacement. A distinguishing feature is the complete enclosure of every part of the belt and drive mechanism, which not only makes the machine conform to safety requirements, but also enables an efficient dust-collecting system to be added to it. It may be mounted on a steel stand to make it completely self-contained, if required.



Delta 6-In. Belt Surfacer

Supero Siameez Duplex Hose

The illustration shows a rubber hose of radically new construction which has been placed on the market by Electric Hose & Rubber Co., Wilmington, Del. The hose is especially designed for use on welding equipment and for similar services. Twin rubber tubes are simultaneously molded with a connecting web between them so that a cross section resembles the figure 8. A single length of this non-kinking hose is all that is necessary for equipment which heretofore has required two separate tubes.

An additional advantage consists in

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Supero Siameez Duplex Hose

that the hose is of Supero construction with a special cord-wound reinforcement between the first and second braid, giving it a much higher burst limit than ordinary welding tubing. With the ¼-in. size, the burst limit is 2000 lbs. The Supero construction permits the use of developing pressures in each of the tubes without torque or writhing.

Supero Siameez Hose is made with the individual tubes in different colors, as red and black, or red and green, or it can be had with both lines the same color. The connecting web may be cut down to the distance required for attaching the hose to special outlets.

Duflex

A flexible finish for high-grade metal products which are subject to extremely hard use, such as golf sticks and fishing rods, to be known as "Duflex", has been developed by Maas & Waldstein, Newark, New Jersey.

Duflex is said to closely resemble the finish produced by extruding or cementing celluloid upon a metal base. In finishing a product with Duflex, such as the metal shaft for a golf club, the product is first covered with a primer coat of synpex enamel which air-dries rapidly and does not require baking before cleaning. The grain is then applied in the usual manner and both coats are baked. After baking, the product is given five dip coats of clear Duflex lacquer. The resulting finish has a deep gloss and is said to be very flexible and durable. A wide variety of metals can be finished by this process.

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Porter-Cable "Take-About" Sander

A balanced, portable sander using a 4x27-in. abrasive belt has been placed on the market by The Porter-Cable Machine Co., Syracuse, N. Y.

This machine is designated as the Take-About Sander, Type T-4. The frame is of polished aluminum, with molded bakelite intake and exhaust air grids. Both rear and front handles are non-metallic. The front and rear pulleys are each 4 in. wide by 2¾ in. diameter. The rear, or driving pulley, is operated through a silent transmission powered by a 1¼ h.p. universal motor of any voltage required. The motor is placed in a horizontal position, parallel to the sanding shoe, thus giving the machine a true balance in all directions.

Porter-Cable "Take-About" Sander

With a belt speed of 1650 r.p.m., the sander is said to remove paint, varnish or other finish materials right down to the base. It is also useful for light metal grinding operations.

A portable belt sander of this type is useful for the elimination of hand

labor on both production and maintenance work.

Mathews Ball Bearing Heavy Duty Rollers

The Mathews Conveyor Company, Ellwood City, Pa., announces two new ball bearing roller designs, both suitable for heavy duty service. In both designs are incorporated self-contained double seals which protect the ball bearings and ball race-ways from foreign matter such as dust, dirt and grit. The illustration Fig. 1 shows the construction of the Type 63SB Roller. This design is available in 4-in., 4¼-in., and 4½-in., diameters, with rollers in standard lengths from 6 in. to 48 in. and spaced center to center from 6 in. up to suit specific requirements.

Industrial grease fittings afford a means of periodical lubrication. Load ratings vary with the three available diameters as follows: Used as gravity roller conveyor (conveyor sections set at a grade) continuous load rating per roller 4-in. diameter, 3000 lbs.; 4¼-in. diameter, 4000 lbs.; 4½-in. diameter, 4500 lbs. When used in level lines; 4-in. diameter, 3500 lbs.; 4¼-in. diameter, 4500 lbs.; 4½-in. diameter, 5000 pounds.

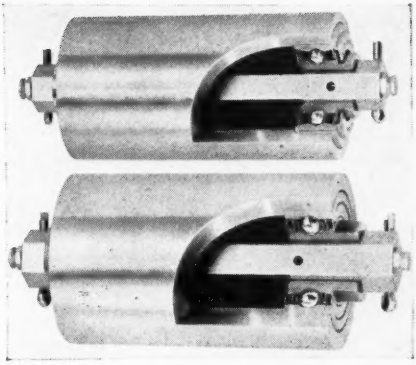

Fig. 1—Mathews 4½-In. Diameter Roller with Type 63SB Bearing for Roller Conveyor

Fig. 2—Type 105SB Bearing for Roller Conveyor

Figure 2 features the Type 105SB Roller. This design includes similar features to those described for Type 63SB and is available in 5-in. diameters and lengths to suit within practical limits. The Type 105SB is applied for

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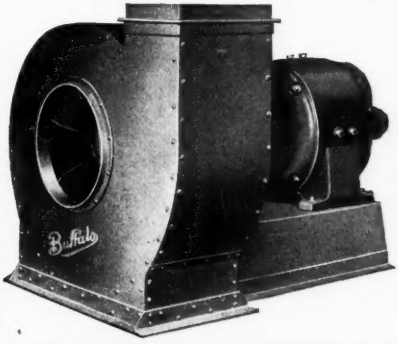

• Making those grinding and polishing operations safer for your employees is only part of the job of these better fans. Any fan can do that when it is new, but to do the job thoroughly, efficiently, and economically year after year, long after the entire investment has been written off is something else. And that is the "something else" you get when you specify "Buffalo" Standard Mill Exhausters.

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both power driven and gravity applications. Each roller has a continuous load rating of 8000 lbs. per roller.

Hexagon axles are incorporated in both types, thus preventing the inner ball race-way from rotating on the axle, which is held stationary in the conveyor frame. Seamless steel tubing is used in both designs, the wall thickness varying with the diameters as follows: Type 63SB, 4-in. diameter, 5/16-in. wall; 4¼-in. diameter, 7/16-in. wall; 4½-in. diameter, 9/16-in. wall. Type 105SB, 5-in. diameter, .710 in. wall. Frame rails of various shapes are available as standard with rollers above or below the top of the frame as required.

Short Coupled Fostoria Machine Lamp

A short coupled localized lighting unit especially adapted for use where the space for the attachment is limited has

No. 12 Fostoria Machine Lamp

been brought out by The Fostoria Pressed Steel Corp., Fostoria, Ohio. As in the case of all Fostoria lamps, the reflector is joined permanently to the socket holder, which prevents the socket from pulling apart. The No. 12 unit, which is shown in the illustration, is 12½ in. overall and is equipped with the regular No. 32S Shade Assembly which accommodates up to a 60 watt bulb. The No. 12C is 11½ in. overall and is equipped with the No. 16S Shade Assembly which accommodates 15 and 25 watt bulbs. Each unit is attached to a stamped base with two 11/32-in. holes for mounting, spaced 2 in. center to center and assembled to a short tube 3 in. from the base plate to the center of the ball socket.

Both models are assembled complete with key socket, 4 ft. Underwriters' approved rubber cord and plug. The lamps are furnished in either dark green or machine grey.

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Wet-X-Hale

The Wet-X-Hale Paint-Compound Co., 572 Greenwich St., New York, N. Y., has placed on the market a compound, which, when mixed with paints, lacquers and varnishes (including primers, natural and synthetic resins, nitrocellulose, nitro combination and chlorinated rubber lacquers), can safely be applied to moist and wet surfaces.

In spite of the moisture deposit on surfaces and moisture in the air, the reaction of "Wet-X-Hale" causes moisture-proofing and rust-proofing and deposits the paint film firmly on the moisture-proofed surfaces underneath. A paint mixed with Wet-X-Hale can be brushed or sprayed. The compound in the paint reacts heavily upon water. It absorbs the water, then separates from the paint and forces itself through the paint to the top of the paint film where the entire waterladen compound decomposes and evaporates completely. The paint film is therefore left on the surface in its original state, forming a homogeneous cover.

Due to the exhaling of water and compound, the paint film is made secure against reversible action; no water can work its way back through the paint. Thus the paint film is protected against peeling, blistering, and so on, and the surface underneath against rusting and corroding. A second and a third coat of a Wet-X-Hale and paint mixture can be applied over a first and second coat respectively.

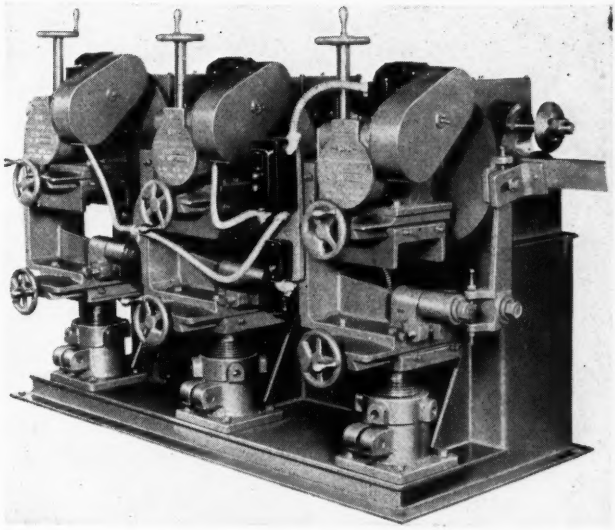
Iron and steel parts prepared at the factory with a coat of varnish or paint on dry surfaces are usually exposed to moisture during erection, therefore the parts should receive one or more coats of Wet-X-Hale for protection. To prepare an ordinary paint with Wet-X-Hale compound requires 5 parts of compound

added to 95 parts of paint, with the usual procedure of stirring the paint well before adding the Wet-X-Hale.

Acme Automatic Tube and Pipe Polishers

The Acme Manufacturing Company, Detroit, Mich., has added to the line of Acme automatic polishing and buffing machines a single and a three-wheel automatic to be known as the Type "T" and the Type "T-3" for polishing tubing and pipe.

The Acme Type T is a single wheel machine having a frustum-shaped, leather-lined, feed disc, which is vertically adjusted by a top hand wheel for setting the speed of feed of the tube of pipe from 1 up to 20 ft. per minute, and is V-belt driven by a totally enclosed ¼ h.p. motor. A center hand wheel is used for tube size adjustments up to several inches diameter. A lower hand wheel is for wheel wear and pressure adjustment. A polishing spindle is driven by either a 5 or 7½ h.p. totally enclosed fan-cooled motor, and is provided with adjustable mounting in a semi-enclosed steel fabricated base. The overall space is 50 in. by 50 in. and the net weight is approximately 1300 pounds.



Acme Type T-3 Three-Wheel Automatic Tube and Pipe Polishing Machine

The Acme Type T-3 is a three-wheel machine used to perform three polishing operations in a single loading. The feed arrangement is similar to the Type T.

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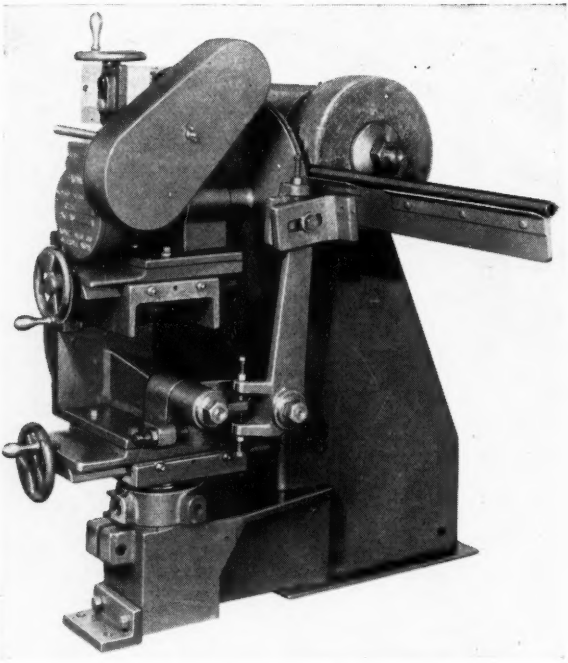

Acme Type T Single-Wheel Automatic Tube and Pipe Polishing Machine

The base consists of a single steel fabricated unit having three polishing spindles equally spaced and driven through a countershaft inside of the base. The countershaft is driven by a 1500 r.p.m. totally enclosed fan-cooled motor mounted on an adjustable base at the rear of the machine. Each polishing spindle is adjustable so that polishing wheels of various diameters can be easily set into line, merely by adjusting a hand wheel. The total length of the machine is 70 in. and the net weight is approximately 3500 lbs. The machine can also be built with more than three polishing spindles if desired.

Quaker TF-318

The Quaker Chemical Products Corp., Conshohocken, Pa., has brought out a product to be used for the prevention of spotting out on metal, to be known as "TF-318". After work is removed from the plating bath, parts should be given a cold water rinse and then soaked 5 min. in a hot solution of TF-318, using 6 ozs. to the gallon of water. This should be followed by a hot rinse in a mild alkaline water made of about 5 lbs. sal soda to 300 gallons of water. The work is then ready for finishing, polishing, coloring, and so on.

TF-318 has been used successfully by throwing a portion of it into the tumbling barrels in such cases where the tumbling operation is used before finishing. TF-318 is said to be easy to handle and to mix readily with water in all proportions.

Clenesco Enamel Cleaner

A metal cleaning compound, to be known as "Clenesco Enamel Cleaner", has been announced by The Cowles Detergent Co., 10525 Carnegie Ave., Cleveland, Ohio. It is stated by the manufacturer, that considerable experiment has shown that this cleaner can be successfully used in plants which manufacture reflectors, stoves, hollow ware, thermometers, and other articles with a porcelain enamel finish.

The drawing compounds on deep drawn work as well as mill oil and other lubricants used in fabrication are said to be removed successfully in a minimum of time. Clenesco Enamel Cleaner rinses easily and has been found to be most economical due to the fact

McAleer

● The extensive McALEER line of buffing compositions and lacquer rubbing compounds is well recognized for its quality, economy, and uniformity.

For complete details write to McALEER—the headquarters for dependable polishing and buffing supplies.

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that it may be worked for long periods before its is necessary to dump the tank.

Packer Portable Polishing and Buffing Machine Vertical Type No. 1

For buffing the inside surfaces of bread and serving trays, comports, vegetable salad dishes and similar hollow ware products, The Packer Machine Co., Meriden, Conn., pioneer builder of automatic polishing and buffing machines, has brought out a vertical type portable polishing and buffing machine to be known as "No. 1".

Standard equipment includes one oval chuck with a maximum diameter of 21 in. A hand wheel is provided for controlling longitudinal adjustment of the stand. A vertical hand wheel is provided for raising and lowering the chuck for loading and unloading work. A crank handle mounted to the side of the chuck base permits adjustment for eccentric setting of the chuck. Standard equipment also includes a totally

Packer Portable Polishing and Buffing Machine Vertical Type No. 1

enclosed, dustproof ball bearing, 1½ h.p. 1750 r.p.m. motor. The gear mechanism for the rotating chuck is contained in a dustproof oil reservoir.

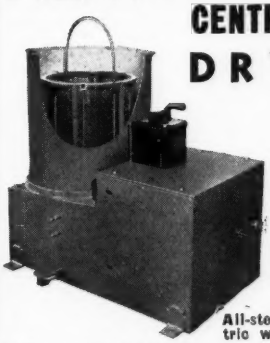
Spray Engineering 14-B Spray Gun

A number of valuable features of design and construction have been incor-

Spray Engineering 14-B Spray Gun

porated in the "14-B" Spray Gun, which has been placed on the market by the Spray Engineering Company, 151 Central St., Somerville, Mass. The nozzle parts and inner connections are of

NEW! KREIDER CENTRIFUGAL DRYER



for

Drying all types of Plated Work and Lacquering Small-Parts

All-steel and electric welded.

Fully enclosed ¾ H.P. motor . . . reversing drum switch . . . foot brake . . . V-belt drive . . . basket rotates at 625 R.P.M. . . . maximum floor space required is 32" x 18".

Write for complete details.

DELLINGER MFG. CO.

727 N. PRINCE ST., LANCASTER, PA.

stainless steel, and the fluid valve design has been improved to make control more fool-proof and accurate. The spreader has stainless steel inserts, and the air valve construction has also been redesigned.

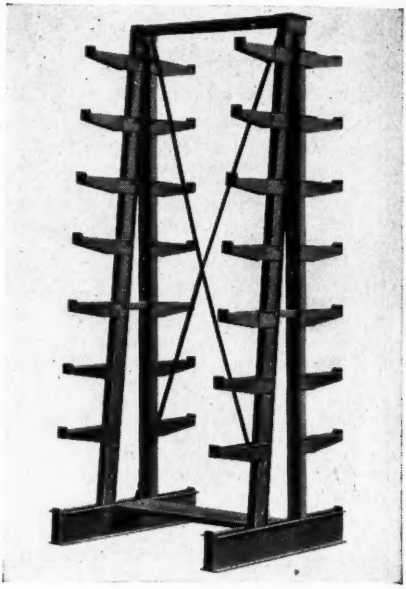
The one-piece gun-body is of drop-forged aluminum, and according to the manufacturer, the 14-B has a minimum of weight. All of the outstanding features of the 14-A model have been retained, and changes have been made in the interest of increased ruggedness, long life, and freedom from maintenance troubles. All fittings are chromium plated, giving the gun an attractive appearance.

"General" Pipe and Bar Rack

The General Fireproofing Co., Youngstown, Ohio, has brought out a pipe and bar rack of heavy construction consisting of two upright assemblies made up of posts, brackets and base channels. The upright assemblies are connected at top and bottom by formed channel plates and diagonal stay braces. The base is of heavy 6-in. channels and the posts are 2x3-in. channels. Brackets for carrying the load of pipe or bars are bolted to the posts, which are punched at 3-in. intervals for space adjustment.

The brackets are of heavy section and each will support a load of 2000 lbs. Each has a front lip to hold stored material in place and has a clear depth of 12 in. Each upright is equipped with 14 brackets and the base is also fitted with front lips so that it may also be used for storage purposes. Where the character of the stored materials makes it desirable, standard shelves of 12-in. depth may be placed on the brackets.

Pipe and bars of any length may be stored on these racks by assembling the required number of racks. In such cases one starting unit complete as above described and the required number of additional units, consisting of one upright assembly only and the connecting members, are used.



"General" Pipe and Bar Rack

Mattison No. 424 Internal Tube Grinding and Polishing Machine

The Mattison Machine Works, Blackhawk Park Ave., Rockford, Ill., has placed on the market an internal tube grinding and polishing machine to be known as the "Mattison No. 424".

The Mattison tube grinder is designed for grinding and polishing the interior of tubes and pipes, and is applicable to the grinding of stainless and alloy steels, carbon steel, bronze, brass, and composition, seamless or welded. Sizes handled range from $\frac{5}{8}$ in. inside diameter and up, and in lengths up to 50 ft. In the dairy, food, drug and other similar industries where products for human consumption are handled, the interior tubing can be kept perfectly smooth, and altogether free from pits or other imperfections.

In other instances, such as boiler tubes, oil-handling tubes, or other parts where there is a tendency to leave a deposit or build up a scale, a smooth interior can be insured.

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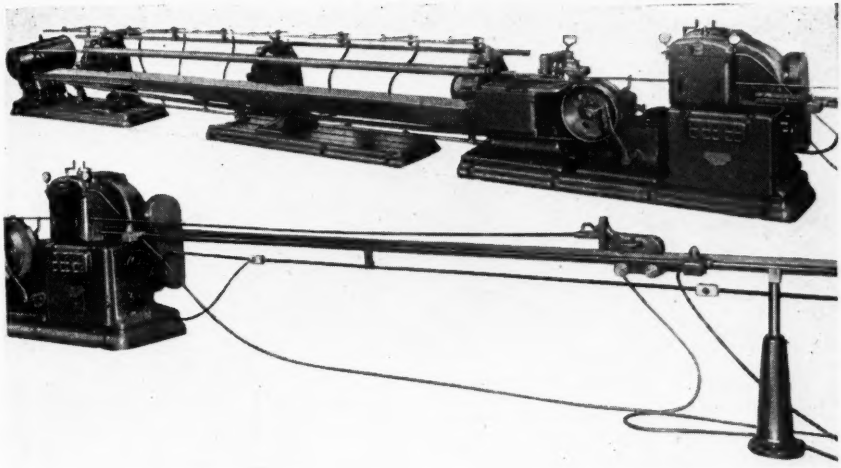

Mattison No. 424 Internal Tube Grinding and Polishing Machine

With the Mattison grinder, the grinding medium is a flexible abrasive belt. The grade of finish is determined by the grade of the abrasive used. It can be a rough, superficial grinding for removing loose scale and other undesirable foreign matter or any desired stage up to a high polished surface.

In operation, the abrasive belt is passed through the tube and the ends are joined to make it endless. The belt passes around a pulley on the driving motor at one end of the machine, and around an idler having a tensioning device at the other end. In joining the belt, the ends are butted together and a piece of cement-coated tape material is placed over the joint. Grinding pressure is applied to the belt by an expansible grinding head attached to a traveling ram rod. Compressed air passes through the rod and into the head, thus expanding the head against the belt. The ram is power-driven and drives the head back and forth through the tube. Automatic trips are set to effect reversal according to the length of the tube being ground.

The tube to be ground, is mounted on rubber-faced supporting and driving rolls. One set of rolls is driven which causes the tube to revolve during the grinding operation. A water spray is provided for cooling the tube, thus permitting fast grinding without overheating the metals. The floor space required for grinding and polishing 25 ft. tubes is 5 ft. wide and 71 ft. long. For each additional 5 ft. of tube length 10 ft. to overall length of machine is added.

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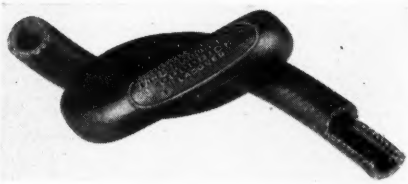
Goodrich Lacquer Hose

A hose which is said to be designed especially for spraying various types of lacquer and synthetic enamels has recently been announced by The B. F. Goodrich Company, Akron, Ohio. The



Goodrich Lacquer Hose

tube of this hose is made of an improved form of Thiokol, known as Thiokol "D", which from tests has been shown to have a high resistance to the solvents found in lacquers. The hose is of braided construction and has a smooth, flexible cover made of a tough black rubber compound. Goodrich Lacquer Hose is available in 500-ft. lengths in ¼-in., ⅜-in. and ½-in. sizes.

Binks Automatic Turntables for Spray Finishing

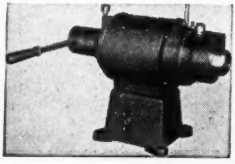
The Binks Manufacturing Company, 3114 Carroll Ave., Chicago, Ill., has placed on the market air and electric motor turntables. By means of an air regulator on the air-operated model, the revolving turntable can be set at any desired speed. On the electric model, the speed is regulated by a variable speed pulley. The motor itself is totally enclosed to protect it from paint and dirt. The article which is being finished, when placed on the turntable, can be revolved in front of the operator without loss of time or waste by simply pressing the foot pedal which controls the motor.

The handy foot pedal gives instant stop and go operation, and at the same time leaves both hands of the operator free to handle the spray gun and the object being sprayed. The revolving turntable disk is furnished round or square from 8 to 24 in. in diameter. The standard height of the turntable

Binks Automatic Turntable for Spray Finishing

is 30 in., but may be made higher or lower according to specifications.

IDEAL SPEED LATHES



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2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks, Hand operated or automatic. Write for Cir. 351.

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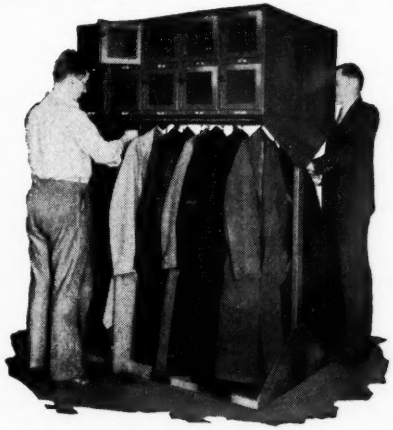
903 Broadway Cincinnati, Ohio

Lyon Shoprobe

The problem experienced in most manufacturing plants of finding room to store employees' outer garments without having to provide locker rooms especially for this purpose has been solved by the development of the Lyon Shoprobe, product of Lyon Metal Products, Inc., 7936 Railroad Ave., Aurora, Ill. This piece of equipment can be moved about as required, and accommodates twenty persons with a separate, lockable compartment for personal belongings. Coat hangers are not removable and a chain may be supplied for locking coats

to the hangers through the sleeve. A shoprobe to accommodate twenty persons occupies 12½ sq. ft. of floor space.

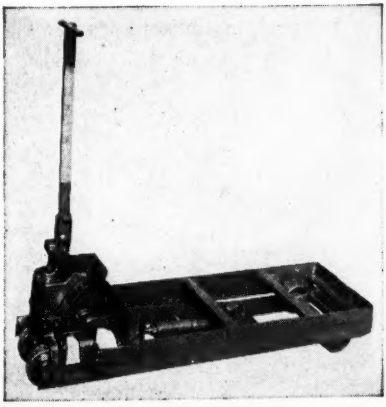


Lyon Shoprobe

The Shoprobe is easy to keep clean and permits maximum inspection and supervision. Made of all steel, the Shoprobe is of heavy, substantial construction.

Yale & Towne Double Duty Hinged Frame Hand Lift Truck

The illustration shows the Yale & Towne Double Duty Hinged Frame Hand Lift Truck, which has been developed by the Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia, Pa., to provide a means for handling skid platforms of varying under-clearances. When the hinged frame is in the upright position, the truck may be rolled under platforms having clearance of from 6 to 7½ inches. A few quick strokes of the handle raises the load from the floor. The lift is 3 inches.



Yale & Towne Double Duty Hinged Frame Hand Lift Truck

Where platforms with clearance ranging from 8 to 10 inches are to be moved, the hinged frame is dropped into place on the regular frame and quickly elevated. Firms that ship their produce on skid platforms will find that this truck will save a great deal of time.

Yale & Towne also builds the multi-stroke truck without the hinged frame and with a lift of 5 to 6 inches. The 6-inch lift model may be rolled under platforms with a clearance of 6½ to 11½ inches, elevated by pulling down on the handle, and then the load is moved into freight cars or trucks on ball bearing wheels.

Morse Can Tilting Rack

For convenience, cleanliness, and safety, the Morse Manufacturing Co., Inc., Syracuse, N. Y., has brought out a

FLEXEMENT
Flexible Polishing Wheel Cement
Makes Wheels Cut 3 to 5 Times Longer!

FLEXEMENT is quickly and easily applied and produces a flexible head that cuts faster and longer—Can be forced dried—Eliminates glue pots, cooking, air conditioned wheel rooms, etc.—Users report savings up to 60% over old methods.

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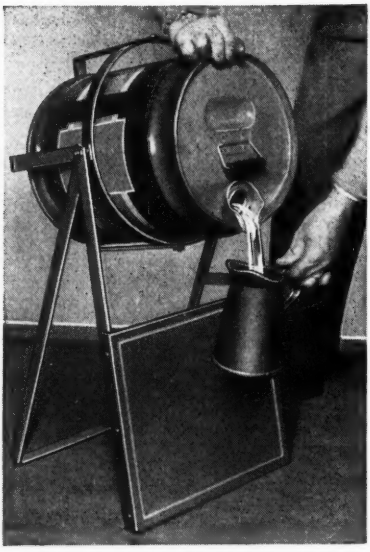


Morse Can Tilting Rack

can tilting rack. The rack is made to hold either round or square five-gallon cans in such a manner that the can may be emptied merely with a "touch of the finger". Lifting cans, getting hands soiled, and spilling the contents is said to be eliminated.

The unit is built of steel, very strong and is practically indestructible. The unit is also collapsible and weighs but 8 pounds.

Thorite Mallet

The Forsberg Manufacturing Company, Bridgeport, Conn., is now marketing a mallet for use in aligning work in a lathe chuck, for setting up work

Thorite Mallet

on machine tools, and for use in other places where a mallet must be used but where marring or scratching of the work-pieces is not permissible. The mallet is made of a composition known as "Thorite", said to be impervious to the action of glass, oils, age, and so on. The mallets are of variable concentration, weights and hardness without loaded cores.

The mallet is furnished in four sizes weighing, without handle, 12, 18, 24 and 32 oz. The head in all cases is 2x3x⅜ in. Weight per dozen ranges from 14¼ to 28 lbs. The mallets are packed one-half dozen in a carton.

Vertical Capstan Car-Pullers

The Fridy Hoist & Machinery Co., Mountville, Pa., has placed on the market a Junior and Heavy Duty Type Car-Puller. The vertical capstan car-upper is furnished in motor ratings for handling from 100 to 500 tons on slight grades. The Junior 7½ and 10 h.p. have oversize vertical capstans of 10-in. diameter by 13-in. face and of the single spur and worm gear speed reduction type. All of the operating parts are enclosed in a cast iron housing to provide a protection against the weather.

The Heavy Duty 15 and 20 h.p. sizes

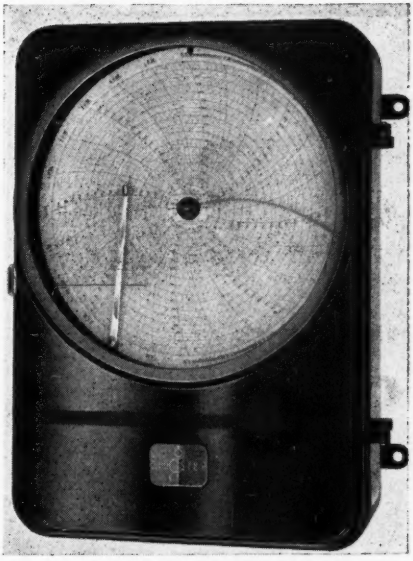
Fridy Vertical Capstan Car-Puller

are especially designed for handling 350 tons to 500 tons on a slight grade. The vertical capstans are 12 in. in diameter by 15¾-in. face. A double steel spur gear and bronze worm operating in oil have a gear ratio of 80:1 or a rope speed of 40 f.p.m. at the capstan. With a Fridy Car-Puller the yard man is said to have complete control of all car replacements, thus saving time and labor in "spotting" loaded railroad cars.

Great Seal Asbestos Cord

The New York Belting & Packing Co., 1 Market St. Passaic, N. J., has announced a new addition to its line of steam hose, a new hose to be known as "Great Seal" asbestos cord. The new addition is said to provide outstanding service in superheated steam service. It is made with four asbestos cord plies, wound spirally in alternating directions around a steam and heat-resisting tube and embedded in rubber. Great Seal has a ply construction which eliminates all possibility of shearing action when the hose expands or flexes in service. The asbestos cords will not char under high temperatures and the black heat-resisting cover is especially compounded for this type of service.

Great Seal cord steam hose is comparatively light in weight, flexible, and easy to handle. The spiral cord construction results in a smaller outside diameter than ordinary four ply asbestos carcass hose. It can also be furnished with special non-statis feature built in. Great Seal comes in ½-in., ¾-in., 1-in., 1¼-in., and 1½-in. internal diameter, accommodating pressures ranging from 175 lbs. to 200 lbs. The maximum lengths are 50 feet.



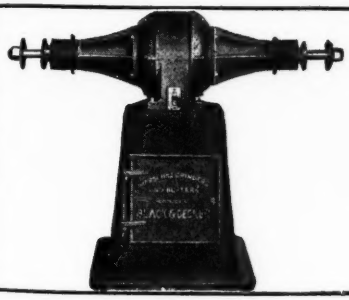
Bristol Pyromaster

Bristol Pyromaster

A recording potentiometer of the round-chart type, to be known as "Pyromaster," has been developed by The Bristol Company, Waterbury, Conn. This recording potentiometer is available as a pyrometer, tachometer, resistance thermometer, millivoltmeter, and milliammeter, and is said to operate on an entirely different principle, which makes possible a number of very important features.

The Bristol Pyromaster requires no lubrication whatever; it is not affected by normal plant vibration; there is no mechanical motion of any kind except when a change in the measured quantity takes place; and it can be used under exceedingly rough plant conditions where the air is laden with dust, moisture, and corrosive fumes. The operating mechanism is made up of five small, compact units, all of which are replaceable. There are no mechanical connections of any kind between the galvanometer unit and the other units.

The extreme simplicity of the principle used in the Pyromaster makes it possible to place the entire mechanism in a standard Bristol Model 40M case, the same type of case that is extensively used for recording thermometers, pres-



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Catalog showing machines with 10" to 30" wheels and 1 to 25 H. P. motors sent upon request.

Vonnegut Moulder Corp.

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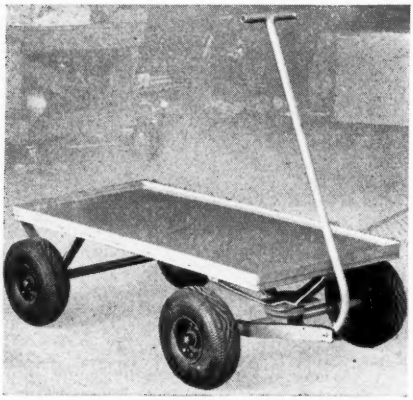
sure gauges, flow meters, and liquid level gauges. The pen of the Pyromaster is actuated in such a way as to follow changes in the measured quantity as they occur and at a rate dependent upon the rate of change.

Saginaw Pneumatic Equipped Truck

A truck operating on pneumatic tires, illustrated herewith, has been placed on the market by the Saginaw Stamping



Saginaw Pneumatic Equipped Truck

& Tool Company, Saginaw, Mich., for the especial use of millwrights, electricians and others who find it necessary to transport their tools from one part of the plant to another. Being equipped with tires, the truck can be taken into offices or easily drawn across rough ground, railroad tracks and similar obstructions. The truck is also convenient for handling manufactured material or products as the design permits very short turning and easy running due to the ball bearing fifth wheel construction and Timken roller bearing wheels.

The truck platform is 40 in. long and the total width over the sides of the wheels is 26¾ in. The surface of the platform is 12¾ in. from the floor. On the truck shown, the tires are 10-in. in diameter and the handle is made from ¾-in. standard pipe. The size of the tires can be varied to suit the capacity of the truck, the capacity being from 500 to 1500 lbs. depending on the size of the pneumatic tires. The truck illustrated has a maximum load capacity of 1000 pounds.

Kreider Centrifugal Dryer

For drying all parts of plated work and lacquering small parts, the Dellinger Manufacturing Co., 727 N. Prince St., Lancaster, Pa., has placed on the market an all-steel and electric welded centrifugal dryer, to be known as the "Kreider Centrifugal Dryer". The base is of steel plate construction throughout, electric arc welded at both ends, and drainage is provided by an outlet plug in the bottom of a cage.

The one basket, size 12 in. by 12 in., is standard equipment with each dryer. It is ruggedly constructed of heavy gage steel woven mesh and steel frame. The handle is rigid. The basket rotates at 625 r.p.m. The main spindle shaft is carried by two large SKF ball bearings. A ¾ h.p. motor, ball bearing equipped, provides ample power for efficient and economical operation. The motor is fully enclosed for protection against moisture and water.

A reversing drum switch is used for operating the motor in either direction. A simple, quick-acting foot brake enables the operator to slow down the machine almost instantly, permitting a rapid reversing of the direction of the basket. Complete and instant control of the dryer speeds up the general production during normal operation.

The unit is 27 in. from the floor to top of basket cage and 30 in. from the floor to the top of outside of cage. The dryer is driven by V-belts, thus eliminating all gear noises. A special belt tightener which operates constantly

Kreider Centrifugal Dryer

when the motor is running is included as standard equipment. The main spindle shaft is greased easily from the outside through Alemite grease fittings.

Young and Bertke Spray Booth and Industrial Laboratory Oven Bulletin. A four-page bulletin in which spray booths, drying ovens, bonderizing tanks, and air conditioners are illustrated is now being issued by The Young & Bertke Co., 1240 Hulbert Ave., Cincinnati, Ohio. The Young & Bertke Co. offers a complete oven service, ovens for baking, japanning, lacquering, enameling, metal lithographing, and various other uses. Young & Bertke engineers are equipped to meet every industrial oven problem. Copy free upon request.

Abrasive Company Grinding Wheels. This book, now being distributed by Abrasive Company, Division of Simonds Saw and Steel Company, Tacony & Fraley Sts., Philadelphia, Pa., contains 180 pages of descriptions, illustrations, and specifications of the grinding wheels made by this firm. Included in this category are vitrified and silicate bonded wheels, shellac bonded wheels, rubber bonded wheels, resinoid bonded wheels, segments, special wheels, coping wheels, rubbing bricks, sticks, cylinder honing sticks, jointer stones, railway track bricks and roll scouring bricks. Cross-section drawings of the various shapes are shown to aid the purchaser in the selection of the proper type of wheel for his work and specifications give all of the various dimensions. The segments are designed for use with the standard chucks such as those made by Blanchard, Bridgeport, Corborundum, Covel-Hanchett, Crossley, Diamond, Norton, Rogers, Seybold, Springfield and Sterling. A copy of this catalog gratis to any mechanical engineer or plant executive.

Ross Air Heaters Bulletin No. 122. This attractive 15-page bulletin devoted to Ross-Harrison air heaters is now being offered by J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y. The topics taken for discussion deal with industrial ovens for drying, baking, and processing, oil and gas fired air heaters, waste heat recovery, air conditioning, and heating, drying and ventilating. The bulletin is well illustrated with photographs, graphs and drawings. The Ross-Harrison air heater is especially adaptable for use in the automotive and similar industries. The efficiency of the Ross-Harrison system of heating is such that there is no inducement to skimp on the air supply for ventilation, even if this volume of air were not required to carry the heat into the oven. The volume of air required to properly heat an oven is always greater than the volume that forms an explosive mixture with the fumes. With the Ross-Harrison system, the air to be heated is forced through the heater tubes by a fan and if for any reason the fan stops or fails to operate properly, the flow of compressed air into the burner is automatically shut off and combustion ceases. This automatic arrangement eliminates the danger of burning out the heater tubes or overheating of the oven through carelessness or through power failure. Since the heaters can be fired with either gas or oil the danger of fuel shortage is negligible. A fan ventilated indirect air heated oven, when occasion requires, can be forced and overloaded by simply speeding up the fans and setting the burner pressures up, or by resetting the dampers, thus changing the heat curve to balance up with the increased fan speed and loading schedule. The Ross-Harrison oven heating systems are under absolute thermostatic control at all times by means of simple recorder controllers of standard make. These instruments can be readily reset to any desired temperature. A copy of Bulletin No. 122 can be had upon request.

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Genuinely Friendly
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